



Tier 1 Endangered Species Act Monitoring and
NPDES Compliance Monitoring
2005 Benthic Macroinvertebrate Sampling
Potlatch Corporation
Lewiston Facility

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1.0 INTRODUCTION

At the request of Potlatch Corporation, AMEC Earth & Environmental (AMEC) has conducted an assessment of the benthic macroinvertebrate community in depositional areas of the Snake River upstream and downstream of the Lewiston Facility ("the Facility"). This report describes the sampling methodology and results of the benthic community analyses.

The Facility is owned and operated by Potlatch Corporation, which has its headquarters in Spokane, Washington. The Facility is located approximately one mile east of the Clearwater Memorial Bridge in Lewiston, Idaho. It is situated on the south bank of the Clearwater River approximately three miles east of the confluence of the Clearwater and Snake River. The location of the Lewiston complex is shown in Figure 1. The Facility discharges treated wastewater via a submerged 48 inch diameter, 400 foot long multi-port diffuser located in the confluence. The diffuser is referred to as Outfall 001. EPA has recently reissued Potlatch's National Pollutant Discharge Elimination System (NPDES) Permit No. ID00001163, authorizing discharge from the diffuser to the Snake River and seeps from the secondary treatment pond to the Clearwater River. The Facility discharges approximately 34 million gallons a day of treated effluent from the diffuser into the Snake River under the permit.

EPA's re-issuance of the Facility's NPDES permit constituted a discretionary action that could beneficially or adversely affect threatened and endangered species or their critical habitat in the vicinity of the discharge. EPA was therefore required to consult with the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration Marine Fisheries Service (NOAA Fisheries) (collectively referred to as "the Services") as specified in the Endangered Species Act (ESA). EPA prepared a Biological Evaluation (BE) to evaluate whether the reissuance of the permit might adversely affect species and/or their critical habitat under the jurisdiction of both the USFWS and NOAA Fisheries. Subsequent to NOAA Fisheries' and USFWS' review of the BE, the two agencies prepared Biological Opinions (BO) consistent with the requirements of the ESA. NOAA Fisheries' BO concluded that the reissuance of the permit "is not likely to jeopardize the continued existence of Snake River steelhead, Snake River spring/summer and fall Chinook salmon, and Snake River sockeye salmon, nor result in the destruction or adverse modification of designated critical habitat for Snake River spring/summer and fall Chinook salmon and Snake River sockeye salmon."

Although the NOAA Fisheries BO concluded that the permit reissuance would not jeopardize the continued existence of the listed species, the BO specified non-discretionary terms and conditions which must be met by EPA and Potlatch to minimize "take" of listed species as a result of permit reissuance. One of the non-discretionary terms and conditions specified in the BO was implementation of a monitoring and assessment plan to characterize conditions in effluent, receiving water, sediment, and biological media in the vicinity of the Facility. Attachment 1 to the permit provides a summary of the required monitoring and a schedule for its implementation. The monitoring plan summary identifies several Tier 1 studies that must be performed during the first two years of the permit, as well as Tier 2 studies that may or may not



be performed during later years of the permit, depending upon the outcomes of the Tier 1 studies.

The purpose of this report is to present the benthic macroinvertebrate results of the ESA Tier 1 studies undertaken during 2005 that collectively evaluate the quality of the effluent and natural waters above and below the Facility. The 2005 sampling was performed to fulfill requirements of the Surface Water and Effluent Study, Benthic Community Study, and the Receiving Water Monitoring Study, that are described in detail in Appendix A, Appendix D, and Appendix H, respectively, of the Quality Assurance Project Plan (QAPP) for Tier 1 Endangered Species Act and NPDES Permit Compliance Monitoring (AMEC and Anchor, 2005). Sediment samples from the Snake River and Clearwater River were collected by Anchor Environmental during the summer of 2005. The samples were submitted to the laboratory for benthic community analysis. However, the results from this study were not reported in time to be included in the January 2006 monitoring report (AMEC, 2006). Therefore, this report should be considered as a supplement to the January 2006 monitoring report. The results of the analytical sediment data are discussed in a separate report (Anchor, 2006).



2.0 FIELD SAMPLING AND LABORATORY METHODS

The purpose of this benthic community study is to evaluate the benthic macroinvertebrate community composition for the purpose of determining whether any potential shifts exist in benthic community composition that could affect the prey base for listed fish species and, if so, whether such shifts may be related to the Facility's effluent discharge. This study evaluates discrete samples of benthic populations in fine-grained sediment areas. Prior to sediment sampling, depositional areas were identified in the Snake River downstream of the Facility so that sampling required by the permit could focus on reaches where potential effects associated with the Facility, if any, would be most likely to occur. A sediment reconnaissance survey was conducted in mid-May 2005 to identify locations containing fine-grained sediments in the reach between the confluence (where the diffuser is located) and the Lower Granite Dam. Appendix I of the QAPP (AMEC and Anchor, 2005) presents a description of the sediment reconnaissance survey, identification of sampling locations for benthic sampling, and the rationale for the selection of these sampling locations.

For the purposes of evaluating potential effects, if any, of the Facility on sediment quality, six stations were chosen as sampling locations for benthic macroinvertebrate community analysis. These locations were selected to provide spatial representation along the reach. Two upstream reference locations were also sampled, one in the Clearwater River and one in the Snake River (Figure 1).

2.1 Field Sampling

Sampling for the benthic community study was conducted on July 25 and 26, 2005. Sampling methodology is described in detail in Appendix D of the QAPP (AMEC and Anchor, 2005). No deviations from the QAPP methodology were made during benthic sampling.

Benthic grab samples were collected at two upstream reference stations and six downstream stations, the latter distributed between the Facility's diffuser and the Lower Granite Dam (Figure 1) (performed in conjunction with sampling required for sediment chemical analysis). The benthic grab samples were collected prior to the collection of sediment intended for chemical analysis, in order to minimize potential disturbance of the bottom substrate and the consequent drift of established invertebrates. Benthic grab samples were collected using a van Veen grab sampler, in accordance with Puget Sound Estuary Program (PSEP) protocols (PSEP, 1997). Penetration depth was approximately 15 centimeters (six inches), and the grab sample area was 0.1 m² (approximately 1 ft²).

Three replicates were collected at each location for individual analysis within a 100 m² area at each sampling location. Three replicates were collected to account for the large amount of variation in benthic macroinvertebrate communities typically encountered over small spatial scales. Each sample was assigned a unique alphanumeric identifier.



Following collection as described above, samples were sieved using a wash bucket equipped with a 0.5 mm bottom mesh. The contents of the sieve bucket (invertebrates, detritus, and sediment) were then transferred into a clean, pre-labeled 1 liter, wide-mouth Nalgene jar containing 85% ethanol.

Samples were shipped via overnight courier to Aquatec Biological Sciences (Aquatec) in Williston, Vermont for enumeration and taxonomic identification.

2.2 Laboratory Analysis

All invertebrates in each sample were counted and identified to family, genus and, if possible, species. If identification down to species was not possible, identification to the lowest practical taxonomic level was conducted. Taxonomic identifications were made by a qualified taxonomist using a binocular dissecting microscope. Identification of some invertebrates, such as oligochaetes and chironomids, require the use of a compound microscope. In these cases, commonly used methods for processing, fixing, and slide mounting were followed. Only widely available, peer reviewed taxonomic keys were used in identification (e.g., Barbour et al., 1999).

A voucher collection of all taxa identified was created as a project QA/QC standard (and as an archival record should QA/QC concerns be raised).

In general, a sample containing many organisms may be subsampled by splitting techniques or by randomly selecting 100 (or more) organisms to reduce potential bias associated with variability in sample volume. This form of subsampling is used to standardize samples due to variation in sample volume. However, for this sampling event, all samples were enumerated and identified because the individual yields were small (<100 organisms/replicate).

3.0 RESULTS AND DATA ANALYSIS

The taxonomy results from 2005 sampling are provided in detail in Appendix A and are summarized in Table 1. Samples at all locations (downstream and reference) consisted of few taxa (less than 10 taxa at all locations), with tubificid worms and chironomid insects dominating most samples. A total of 1,976 organisms in five taxonomic orders were enumerated and identified in 24 samples (three replicates at each of the eight locations; Table 1).

The taxonomic orders observed and the number of organisms enumerated within each order across all locations are as follows:

- 1,265 diptera;
- 663 tubificids;
- 27 amphipods;
- 20 prionodesmaceans; and
- one nematode (nematoda is a phylum, not an order, however identification could not be performed beyond phylum).

The majority of the organisms identified are generally considered to be relatively tolerant to perturbation. No organisms were identified from the orders of Ephemeroptera, Plecoptera, or Trichoptera (observed by Barbour (1999) to be more abundant in pristine habitats, and therefore considered relatively intolerant) at any upstream reference station nor in any downstream sample. This observation may be partly due to the choice of substrate sampled (that is, depositional areas).

Results suggest that the benthic community at reference location CR-REF (located in the Clearwater River) differs from the benthic community at the Snake River reference location (SR-REF) and at the downstream locations in the Snake River. CR-REF is more diverse and has higher abundance than any other location. As described in more detail in subsequent sections, this difference is likely due to differences in river habitat characteristics (such as water temperature and sediment grain size) in the Clearwater River compared to all Snake River locations.

Standard functional macroinvertebrate metrics were generated for each replicate and averaged across replicates at each location (Table 2). A summary of the results for each metric is discussed below, including the results of the comparison of reference and downstream benthic community metrics. Subsequent to this analysis, the relationships between the various benthic community metrics and other variables, such as water temperature, sediment grain size, sediment organic carbon content, and sediment chemistry results, are examined using simple linear regression analysis.



3.1 Reference and Downstream Benthic Community Metrics

This section presents the benthic community metrics for the locations sampled in 2005 and discusses the comparison of metric results at reference and downstream sampling locations.

3.1.1 Taxa Richness

Taxa Richness is the number of distinct taxa in a sample. This metric describes the overall variety (diversity) of a sample and is measured in each replicate. Taxa richness is then summarized across replicates to provide a location-specific total of distinct taxa observed.

Twenty distinct taxa were identified in the 2005 samples over all locations. Reference location CR-REF contains the most diverse community, with ten distinct taxa being identified across the three replicates (Table 2). Downstream location LGP-13 (north bank of the Snake River immediately downstream of the diffuser and the closest location to CR-REF) contained the next most diverse community, with eight distinct taxa. Five taxa were observed across the three replicates at the least diverse locations: LGP-09, LGP-06 and LGP-01 (the three furthest downstream locations).

Taxa richness at SR-REF is most similar to LGP-13 and LGP-14, both immediately downstream of the diffuser. Downstream of LGP-13 and 14, taxa richness decreases slightly with distance from the diffuser. These results suggest that effluent discharge does not affect the benthic community, since one would anticipate a marked decrease in taxa richness immediately downstream of the diffuser, followed by an increase in taxa richness with distance from the diffuser as recovery occurs further downstream.

The average replicate taxa richness is 3.8 for the downstream locations; 4.7 for SR-REF; and, 7.3 for CR-REF (Figure 2). At downstream locations, taxa richness decreases with distance from the diffuser from 4.7 taxa per replicate at LGP-13 to 3.3 taxa per replicate at LGP-01.

The downstream locations were compared to the reference locations using a standard two-tail t-test (assuming unequal variance). Results of the t-tests indicate that none of the downstream locations is statistically significantly different from the Snake River reference ($p > 0.05$) with respect to taxa richness.

There does appear to be a significant difference in taxa richness between certain downstream locations and the Clearwater River reference location. However, taxa richness at the Snake River reference location is significantly different from taxa richness at the Clearwater River reference location. This suggests that the observed differences in taxa richness between downstream and Clearwater River reference locations are associated with differences in habitat and/or physicochemical characteristics, such as water temperature, between the Clearwater and Snake Rivers and not from anthropogenic disturbance, if any, at downstream locations. As discussed in Section 3.2.5, the average water temperature measured at CR-REF during the two weekly sampling events (July 20 and July 27) surrounding the dates when the macroinvertebrates were collected is over eight degrees colder than at SR-REF or at LGP-01 (furthest downstream location).

3.1.2 Abundance

Abundance is a measure of the number of organisms identified in a sample. This metric was calculated by totaling all organisms identified in a given sample. In some cases, this metric is estimated when a sample is required to be sub-sampled. For this study, however, all of the organisms were counted in each sample. The reported abundance is, therefore, an actual enumeration of organisms within the entire sample. Abundance was tabulated for each replicate, averaged over the three replicates per location, and also totaled across replicates to obtain a total abundance at each location. The average abundance per replicate ranged from 14.3 organisms at LGP-11 to 305.7 organisms at CR-REF. Locations SR-REF and LGP-14 had the second highest average abundance at 102.7 (Table 2, Figure 3).

Because a van Veen sampler used for collection has a sample area of 0.1 m² (approximately one ft²), a per square meter density of organisms was calculated by multiplying the abundance measured in each replicate by 10 (Table 2). This calculation results in density estimates ranging from 143 organisms/m² at LGP-11 to 3,057 organisms/m² at CR-REF. The highest total abundance (a sum of all organisms identified in the three replicates from a given location) was observed at CR-REF (917 organisms), with the next most abundant communities (308 organisms) occurring at locations SR-REF and LGP-14 (immediately downstream of the diffuser). The lowest total abundance (43 organisms) is associated with location LGP-11 (approximately 1.75 miles downstream of the diffuser). The total abundance observed by location is consistent with the average abundance by location.

As with taxa richness, the downstream locations were individually compared to the reference locations using a standard two-tail t-test (assuming unequal variance). Four of the downstream locations (LGP-01, LGP-06, LGP-11, LGP-13) appear to be statistically different ($p < 0.05$) from the Snake River reference location (see Table 3). Abundance estimates at LGP-09 and LGP-14 are not significantly different than those at SR-REF ($p > 0.05$). Abundance at downstream locations is not statistically different from abundance at CR-REF (Table 3 and Figure 3). The variability in the CR-REF replicate abundance is relatively high, however, and statistical tests for abundance using CR-REF data may not be especially meaningful. As discussed in Section 3.2, abundance across locations appears to be related to physical habitat characteristics (water temperature and grain size).

The similarity of abundance observed immediately downstream of the diffuser compared to the Snake River reference location, along with the variable abundance observed with downstream distance from the diffuser, provides evidence that effluent is not affecting abundance downstream of the diffuser.

3.1.3 Tolerance

A Tolerance Index describes the overall tolerance of community expressed as a single value. Taxa were ranked from 0 (very sensitive) to 10 (very tolerant) using values reported in the Rapid Bioassessment Protocols (RBP) guidance (Barbour et al., 1999) for the Northwest region, where available. When a Northwest region value was not available for a given taxon, either the value of a nearby region or the value of the next most general taxonomic category was used as a



surrogate. The choice of which surrogate to use depended on how close the nearby region and/or the nearest taxonomic category were to the taxon identified. For each replicate, the tolerance value associated with each unique taxon was totaled to generate a replicate Tolerance Index. This Tolerance Index was then averaged across the three replicates for a location-specific average Tolerance Index (Table 2). The average tolerance value was calculated by taking an average of the tolerance values associated with the distinct taxa at a location.

Twenty total taxa were identified in the 2005 samples (Table 1). Seventeen of these taxa have a tolerance value of 6 or greater, indicating that the majority of organisms in the Snake and Clearwater Rivers are relatively to very tolerant species. The remaining three taxa and their associated tolerance values are amphipoda (4), nematoda (5) and a single species of Chironomidae (3). No highly sensitive (intolerant) organisms were identified at any location. The amphipod was observed only at LGP-01 (the furthest downstream location). A single nematode was identified in one replicate of SR-REF, and a single sensitive chironomid was observed in one of the three replicates at both SR-REF and LGP-14 (immediately downstream of the diffuser).

The average tolerance values per location range from eight (SR-REF) to ten (LGP-09 and LGP-06). These findings suggest that the taxa identified at SR-REF are slightly less tolerant than taxa at locations downstream of the diffuser. These tolerance values indicate that the entire population at both downstream and reference areas is relative tolerant. Tolerance Index values for each sampling location are shown on Figure 4.

Total Tolerance Indices range from 26 (LGP-01; the location with the most sensitive organisms) to 56.3 (CR-REF; the location with the most tolerant organisms). As discussed in previous sections, the Clearwater River appears to have a more diverse community because there are more taxa observed at this location. However, the taxa observed at this location are all categorized as highly tolerant.

As with the previous metrics, the downstream locations were individually compared to the reference locations using a standard two-tail t-test (assuming unequal variance). None of the downstream location Tolerance Indices is statistically different from the Snake River reference location Tolerance Index. The Tolerance Indices at SR-REF and at some of the downstream locations (not LGP-09 and not LGP-13) are statistically different from the Tolerance Index at CR-REF ($p < 0.05$). These results are similar to the taxa richness results, in that the Clearwater River is different from all or nearly all of the Snake River locations irrespective of upstream or downstream location in the Snake River.

The observation of high Tolerance Indices throughout the Clearwater and Snake River systems, and the absence of a difference between Tolerance Indices at upstream and downstream locations in the Snake River is likely associated with habitat factors such as water temperature and not with anthropogenic disturbance (if any). Moreover, unvegetated sandy substrates in colder waters (such as the Clearwater River) favor the presence of oligochaetes or dipterans rather than the more sensitive taxa (for example, Ephemeroptera, Plecoptera and Trichoptera).

(EPT), dragonflies, and damselflies) (Barbour et al., 1999). The high Tolerance Index in the Clearwater River is consistent with this general observation.

3.1.4 Composition

Measures of composition describe the make-up of the benthic community and the relative contribution (rather than absolute abundance) of certain taxa to the community as a whole (Barbour et al., 1999). Barbour et al. (1999) suggest that "a healthy and stable assemblage will be relatively consistent in its proportional representation, though individual abundances may vary in magnitude." However, it should be noted that when absolute abundance is relatively low, a slight variation of one or two organisms can substantially alter the percent composition within the sample, but may not represent an actual difference in the population as a whole. Identification of the dominant two taxa at each location may provide perspective relative to benthic community composition and variability within replicates. Percent dominant taxon measures the percentage of the total number of taxa in a sample that comprise the most frequently observed taxon.

Chironomids were dominant at both reference locations, whereas tubificid worms were dominant in the downstream location samples. With the exception of the furthest downstream location (LGP-01), the two most dominant taxa at all locations (including the reference locations) were tubificids and chironomids. The difference in composition at LGP-01 is due to the identification of amphipods at this location, as described above.

The downstream locations were individually compared to the reference locations using a standard two-tail t-test (assuming unequal variance). None of the downstream location % dominant taxon is statistically different from the percent dominant taxon at either the Snake River reference location or the Clearwater River reference location.

3.2 Simple Linear Regression Analysis

Simple (one-variable) linear regressions were conducted to assess potential relationships between the benthic community metrics and independent variables such as grain size, distance downstream, water temperature, and sediment chemistry. A relationship is considered significant if the p value of the statistical test is less than 0.05. For significant results, the R^2 value identifies the fraction of the variability in the data that can be explained by the relationship between the dependent variable (the benthic community metric) and the independent variable (e.g., grain size, water temperature, chemical concentration) (an R^2 of 1 indicates a very strong correlation between the two variables, as 100% of the observed variability in the data is attributable to the relationship between the variables). Results and discussion of the variables tested are presented in the following sections. Sampling data for the variables tested are shown in Appendix B.

3.2.1 Distance from Diffuser

There appears to be a slight decrease in taxa richness at sample locations with increasing distance from the diffuser (Figure 2). However, the relationship between taxa richness and distance downstream is not significant (p : 0.18; see Figure 5). The relationship between



replicate richness and downstream distance is also not significant ($p: 0.29$; see Figure 6). This finding indicates that effluent does not affect the taxa richness of the benthic community because taxa richness decreases with downstream distance from the diffuser. If effluent had an effect on taxa richness, then taxa richness immediately downstream of the diffuser would be lower relative to taxa richness observed at further downstream locations. Considering that effluent contributes a decreasing percentage of total river flow with downstream distance, the observation of decreasing taxa richness with downstream distance is not likely attributable to effluent.

Location abundance measurements and distance from diffuser are not related ($p: 0.36$; Figure 7). Similar to the diversity results, the relationship between replicate abundance and downstream distance is also not significant ($p: 0.08$; see Figure 8). Abundance decreases slightly with distance downstream. This finding indicates that effluent does not affect abundance in the benthic community because abundance at the farthest downstream location is lower than abundance at locations immediately downstream of the diffuser. If effluent had an effect on abundance, then abundance immediately downstream of the diffuser would be lower relative to abundance observed at further downstream locations.

A statistically significant relationship between Tolerance Index and distance downstream does not exist (Figures 9 and 10).

3.2.2 Grain Size

Grain size was measured in sediment samples collected during the July 2005 sampling event and was summarized the 2005 sediment data report (Anchor, 2006). Grain size distribution analysis measured the fraction of gravel, sand (includes very coarse, coarse and medium sand), fine sand, very fine sand, silt, and clay (Figure 11). Results indicated that fine sand, very fine sand, and silt comprised all or nearly all of the sediment samples collected during July 2005.

A significant direct relationship between percent fine sand and taxa richness was observed ($p: 0.04$; $R^2: 0.46$; see Figure 12). No significant relationship exists between percent fine sand and abundance ($p: 0.23$; see Figure 13). There is a direct correlation between percent fine sand and Tolerance Index ($p: 0.046$; $R^2: 0.43$; see Figure 14). Given the significant relationship between percent fine sand and taxa richness, as well as the previously discussed predominance of tolerant taxa among the observed organisms, it is not surprising to find a significant relationship between percent fine sand and Tolerance Index.

3.2.3 Total Organic Carbon

Total Organic Carbon (TOC) was measured in sediment samples collected during the July 2005 sediment sampling event. TOC was evaluated relative to diversity, abundance and Tolerance Index (Figures 15 through 17). No significant relationships were observed between TOC and taxa richness, abundance, or Tolerance Index.



3.2.4 Chemistry Results

Sediment samples collected in July 2005 were analyzed for dioxins and furans, chlorinated phenolic organic compounds, phytosterols, resin acids, and retene. Regression analyses were conducted using benthic metrics and concentrations of the following analytes:

- Retene (Figures 18 through 20)
- Organic carbon-normalized retene (Figures 21 through 23)
- Total resin acids (Figures 24 through 26)
- Organic carbon normalized total resin acids (Figures 27 through 29)
- B-Sitosterol (Figures 30 through 32)
- Organic carbon normalized B-sitosterol (Figures 33 through 35)
- 2,3,7,8-TCDF (Figures 36 through 38)
- Organic carbon-normalized 2,3,7,8-TCDF (Figures 39 through 41)

Regression analyses were not conducted with chlorinated phenolic organic compounds and 2,3,7,8-TCDD because these compounds were not detected in effluent samples collected and analyzed during quarterly high-volume effluent sampling in 2005. No significant correlations were observed between chemistry data and the macroinvertebrate community metrics.

3.2.5 Temperature

The average weekly temperature measured during the two weekly sampling events surrounding the dates when macroinvertebrates were collected (weeks of July 20 and July 27) was evaluated relative to benthic community metrics. Temperature data was not collected at every location where macroinvertebrates were collected. Therefore, only the co-located results were assessed.

A significant inverse relationship exists between in taxa richness and temperature (p : 0.04; R^2 : 0.62; see Figure 42).

Average abundance measurements and temperature do not appear to be related (p : 0.06; see Figure 43). After mixing with the colder Clearwater River at the confluence, temperature rises with distance downstream in the Snake River. As the Clearwater River is colder than all Snake River locations (reference and downstream), changes in abundance with downstream distance in the Snake River are likely related to changes in temperature rather than downstream distance *per se*. Examining Snake River locations only, a significant relationship exists between abundance and water temperature (p : 0.01; R^2 : 0.88; see Figure 44).

Tolerance index does not appear to be related to water temperature (p : 0.19; see Figure 45), even when only Snake River locations are considered (p : 0.19; see Figure 46).



4.0 SUMMARY AND CONCLUSIONS

This report presents the results of benthic macroinvertebrate community sampling and analysis conducted in July 2005 as part of the Tier 1 Endangered Species Act Monitoring and NPDES Permit Compliance Monitoring required in non-discretionary terms and conditions set forth by the Services in their Biological Opinions on the re-issuance of Potlatch's NPDES permit by EPA.

Evaluation of the benthic community data indicates the following:

- Taxa richness: Taxa richness at downstream sampling locations is not different from taxa richness at the Snake River reference location, but does differ from taxa richness at the Clearwater River reference location. The differences between taxa richness at downstream locations and the Clearwater River reference location is likely attributable to differences in water temperature and/or other habitat characteristics, and not to influence from the Mill's effluent. Taxa richness is significantly correlated with water temperature and is not correlated with concentrations of chemicals measured in sediment samples.
- Abundance: Abundance at downstream sampling locations is not different from abundance at the Clearwater River reference location, although this statistical finding is likely due to very high variability in abundance among Clearwater River reference location replicates. Abundance at some downstream locations differs from abundance at the Snake River reference location. Examining abundance at Snake River reference and downstream locations indicates that abundance is significantly correlated with water temperature. Abundance is not correlated with concentrations of chemicals measured in sediment samples.
- Percent dominant taxa: With the exception of downstream location LGP-01 (the only location where an amphipod was observed), no difference exists between percent dominant taxa at downstream and reference locations.
- Tolerance Index: Tolerance Indices at downstream sampling locations are not different from the Tolerance Index at the Snake River reference location. Although Tolerance Indices at certain downstream locations differs from the Tolerance Index at the Clearwater River reference location, these differences are likely attributable to significant correlations between Tolerance Index and both percent fine sand and water temperature. No significant correlations were observed between Tolerance Index and concentrations of chemicals measured in sediment samples.

The results of the macroinvertebrate sampling reveal no clear indications that the Facility's effluent has any significant influence on the downstream macroinvertebrate community. If the Facility's effluent had an influence on benthic community metrics, one would expect to find a difference between results observed at reference locations and the two locations immediately downstream of the diffuser (LGP-13 and LGP-14), followed by a return to reference-like conditions with increasing distance downstream. This pattern is not observed in any of the benthic community metrics. Moreover, significant relationships exist between benthic metrics and percent fine sand and/or water temperature, whereas no significant relationships exist between benthic metrics and concentrations of chemicals measured in sediment. Accordingly,



the results of the benthic community study indicate that the Facility's discharge has no effect on the benthic community in the Snake River.

In conclusion, the results of sampling and analysis upstream and downstream of the Facility support the finding in EPA's Biological Evaluation and the Services' Biological Opinions that the EPA's re-issuance of Potlatch's NPDES permit is not likely to jeopardize the continued existence of Snake River steelhead, Snake River spring/summer and fall chinook salmon, and Snake River sockeye salmon, nor result in the destruction or adverse modification of designated critical habitat for Snake River spring/summer and fall chinook salmon and Snake River sockeye salmon.

The ESA monitoring and assessment plan summary provided in Attachment 1 to Potlatch's NPDES Permit indicates that the decision to conduct Tier 2 studies will depend upon the results of the Tier 1 studies. According to Attachment 1 of the Permit, if the results of the benthic macroinvertebrate study indicated that effluent chemicals significantly affect the benthic community, a Tier 2 study of benthic tissue chemistry may be warranted. As described above, the benthic community study indicates that effluent has no effect on the benthic community. As such, a Tier 2 study of benthic tissue chemistry is not warranted.



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U.S. EPA. 2003. Biological Evaluation of the Potlatch Corporation Pulp and Paper Mill in Lewiston, Idaho. December 2003.

U.S. EPA. 2005. Authorization to Discharge Under the National Pollutant Discharge Elimination System. Permit No.: ID0001163. Potlatch Corporation 803 Mill Road, Lewiston, Idaho.

Table 1
Benthic Community Data
2005 Sampling
Potlatch Mill, Lewiston Idaho

Phylum	Class	Order	Family	Genus / Species	Tolerance Value	SR-REF-1	SR-REF-2	SR-REF-3	CR-REF-1	CR-REF-2	CR-REF-3	13-1	13-2	13-3	14-1	14-2	14-3
Annelida	Oligochaeta	Tubificida	Tubificidae		10	16	20	18	80	13	11	46	21	26	34	39	90
				Branchiura sowerbyi	10												
			Naididae		10							7		2			2
Nematoda					5		1										
Arthropoda	Crustacea	Amphipoda	Corophidae	Corophium sp.	4												
	Insecta	Diptera	Chironomidae		10				1					1			
				Chironomid pupa		3	2	4	5	1	2				5	2	2
				Chironomus sp.	10	60	94	72	277	227	158	3		1	59	37	36
				Dicrotendipes neomodestus	8							1	1				
				Tanypus sp.	8.8												
				Endochironomus sp.	10				36	12	26	1	1			1	
				Harnischia sp.	8				5	7	1						
				Paratanytarsus sp.	6						2						
				Thienemannimyia sp.	6				1								
				Rheotanytarsus exiguus	6							1					
				Nanocladius sp.	3		1									1	
				Procladius sp.	9	2		12		1							
				Procladius sublettei	9		3					1					
				Ablabesmyla sp.	6												
Mollusca	Pelecypoda	Prionodesmacea	Sphaeriidae	musculium sp.	8				6								
Aquatec QC: additional organisms noted during QC																	
Annelida	Oligochaeta	Tubificida	Tubificidae		10				8		1						
Mollusca	Pelecypoda	Prionodesmacea	Sphaeriidae	musculium sp.	8				11		3						
Arthropoda	Insecta	Diptera	Chironomidae		10				1								
				Endochironomus sp.	10				3		2						
				Chironomus sp.	10				12		4						
Richness (# Taxa): replicate						4	6	4	8	7	7	7	3	4	3	5	4
Richness (# Taxa): location							7			10			8			6	
Abundance (# organisms): replicate						81	121	106	440	267	210	60	23	30	98	80	130
Tolerance Index (RBP-Northwest)						29	37	29	62	55	52	63	28	40	20	33	30

Notes:

1. Tolerance Indices were calculated by summing the Tolerance Values per taxa observed in a replicate. A larger tolerance Index indicates the presence of species that are more resistant to pollution.
2. Tolerance Values obtained from Barbour et al (1999). Values reported under Northwest Region (Idaho) were used in Tolerance Index calculation. If Northwest values were not available, either the value for the taxa from a nearby geographic region or a value from the next most general taxonomic category was used, depending on the region available.

Table 1
Benthic Community Data
2005 Sampling
Potlatch Mill, Lewiston Idaho

Phylum	Class	Order	Family	Genus / Species	Tolerance												
					Value	11-1	11-2	11-3	9-1	9-2	9-3	6-1	6-2	6-3	1-1	1-2	1-3
Annelida	Oligochaeta	Tubificida	Tubificidae		10	8	16	6	42	67	39	5	6	18	8		
				Branchiura sowerbyi	10											2	1
			Naididae		10						3						
Nematoda					5												
Arthropoda	Crustacea	Amphipoda	Corophidae	Corophium sp.	4										13	5	9
	Insecta	Diptera	Chironomidae		10		1				1		1				
				Chironomid pupa								1					
				Chironomus sp.	10	3	1	4	9	5	5	4	9	3	4	2	9
				Dicrotendipes neomodestus	8	1											
				Tanypus sp	8.8			1									
				Endochironomus sp.	10	1			1	2	1		1	2			
				Harnischia sp.	8												
				Paratanytarsus sp.	6												
				Thienemannimyia sp.	6												
				Rheotanytarsus exiguus	6												
				Nanocladius sp.	3												
				Procladius sp.	9												
				Procladius sublettei	9												
				Ablabesmyla sp.	6	1									1		
Mollusca	Pelecypoda	Prionodesmacea	Sphaeriidae	musculium sp.	8												
Aquatec QC: additional organisms noted during QC																	
Annelida	Oligochaeta	Tubificida	Tubificidae		10				6	2							
Mollusca	Pelecypoda	Prionodesmacea	Sphaeriidae	musculium sp.	8												
Arthropoda	Insecta	Diptera	Chironomidae		10												
				Endochironomus sp.	10												
				Chironomus sp.	10												
Richness (# Taxa): replicate						5	3	3	3	3	5	3	4	3	4	3	3
Richness (# Taxa): location							7			5			5			5	
Abundance (# organisms): replicate						14	18	11	52	80	51	10	17	23	26	9	19
Tolerance Index (RBP-Northwest)						44	30	28.8	30	30	50	20	40	30	30	24	24

Notes:

1. Tolerance Indices were calculated by summing the Tolerance Values per taxa observed in a replicate. A larger tolerance Index indicates the presence of species that are more resistant to pollution.
2. Tolerance Values obtained from Barbour et al (1999). Values reported under Northwest Region (Idaho) were used in Tolerance Index calculation. If Northwest values were not available, either the value for the taxa from a nearby geographic region or a value from the next most general taxonomic category was used, depending on the region available.

Table 2
Benthic Community Metrics
2005 Sampling
Potlatch Mill, Lewiston Idaho

Diffuser →								
Metric	SR-REF	CR-REF	LGP-13	LGP-14	LGP-11	LGP-09	LGP-06	LGP-01
Taxa Richness								
No. of Unique Taxa: Location (sum of replicates)	7	10	8	6	7	5	5	5
No. of Unique Taxa: Replicate (avg. of replicates)	4.7	7.3	4.7	4.0	3.7	3.7	3.3	3.3
Abundance								
No. of Organisms: Replicate (avg. of replicates)	102.7	305.7	37.7	102.7	14.3	61.0	16.7	18.0
No. of Organisms / m ² : Replicate (avg. of replicates)	1026.7	3056.7	376.7	1026.7	143.3	610.0	166.7	180.0
No. of Organisms: Location (sum of replicates)	308	917	113	308	43	183	50	54
Tolerance								
Avg. Tolerance Value: (for location)	8.0	8.7	9.1	8.8	9.0	10.0	10.0	8.3
Avg. Tolerance Index	31.7	56.3	43.7	27.7	34.3	36.7	30	26
% Chironomids + %Oligochaetes	99.7%	97.8	100	100	100	100.0	100	50
Composition								
Primary Dominant Taxon	Chironomus sp.	Chironomus sp.	Tubificidae	Tubificidae & Chironomus sp.	Tubificidae	Tubificidae	Tubificidae & Chironomus sp.	Amphipod & Chironomus sp.
% Primary Dominant Taxon	73.2	75.9	84.9	59.4	66.9	84.1	60.4	66.8
Secondary Dominant Taxon	Tubificidae	Tubificidae & Endochironomus sp.	Dicrotendipes neomodestus & Endochironomus sp. & Naididae	Chironomus sp. & Tubificidae	Chironomus sp.	Chironomus sp.	Chironomus sp. & Tubificidae	Tubificidae & Branchiura sowerbyi & Chironomus sp.
% Secondary Dominant Taxon	17.8	12.4	9.0	36.2	23.0	11.1	29.4	26.8

Notes:

1. Values represent an average of three replicates per station to generate a Station-specific value unless otherwise noted.
1. Tolerance Indices were calculated by summing the Tolerance Values per taxa observed in a replicate. A larger tolerance Index indicates the presence of species that are more resistant to pollution.
3. Tolerance Values obtained from Barbour et al (1999). Values reported under Northwest Region (Idaho) were used in Tolerance Index calculation. If Northwest values were not available, either the value for the taxa from a nearby geographic region or a value from the next most general taxonomic category was used, depending on the region available.

Table 3
Comparison of Reference and Downstream Benthic Community Metrics
2005 Sampling
Potlatch Mill, Lewiston Idaho

Downstream Location	Number of Taxa		
	p-value for 2-tailed t-test, Downstream versus:		
	SR-REF	CR-REF	All Reference
LGP-01	> 0.05	0.001	0.01
LGP-06	> 0.05	0.001	0.01
LGP-09	> 0.05	0.02	> 0.05
LGP-11	> 0.05	0.02	> 0.05
LGP-13	> 0.05	> 0.05	> 0.05
LGP-14	> 0.05	0.01	> 0.05
All Downstream	> 0.05	0.0004	0.02

SR-REF results are significantly different from CR-REF results (p=0.04)

Downstream Location	Abundance		
	p-value for 2-tailed t-test, Downstream versus:		
	SR-REF	CR-REF	All Reference
LGP-01	0.01	> 0.05	0.02
LGP-06	0.01	> 0.05	0.02
LGP-09	> 0.05	> 0.05	0.05
LGP-11	0.01	> 0.05	0.02
LGP-13	0.01	> 0.05	0.03
LGP-14	> 0.05	> 0.05	> 0.05
All Downstream	> 0.05	> 0.05	0.03

Comparisons to CR-REF abundance should be interpreted considering the high variability in abundance in CR-REF replicates

Downstream Location	Percent Dominant Taxa		
	p-value for 2-tailed t-test, Downstream versus:		
	SR-REF	CR-REF	All Reference
LGP-01	0.004	0.03	0.0006
LGP-06	> 0.05	> 0.05	> 0.05
LGP-09	> 0.05	> 0.05	> 0.05
LGP-11	> 0.05	> 0.05	> 0.05
LGP-13	> 0.05	> 0.05	> 0.05
LGP-14	> 0.05	> 0.05	> 0.05
All Downstream	> 0.05	> 0.05	> 0.05

Downstream Location	Tolerance Index		
	p-value for 2-tailed t-test, Downstream versus:		
	SR-REF	CR-REF	All Reference
LGP-01	> 0.05	0.002	0.03
LGP-06	> 0.05	0.03	> 0.05
LGP-09	> 0.05	> 0.05	> 0.05
LGP-11	> 0.05	0.03	> 0.05
LGP-13	> 0.05	> 0.05	> 0.05
LGP-14	> 0.05	0.005	> 0.05
All Downstream	> 0.05	0.001	> 0.05

SR-REF results are significantly different from CR-REF results (p=0.004)

Table 4
Simple Linear Regression of Benthic Community Metrics and Potential Independent Variables
2005 Sampling
Potlatch Mill, Lewiston Idaho

Potential Independent Variable	Number of Taxa		Abundance		Tolerance Index	
	p-value	R ²	p-value	R ²	p-value	R ²
Distance Downstream	> 0.05		> 0.05		> 0.05	
Sediment Total Organic Carbon	> 0.05		> 0.05		> 0.05	
Percent Fine Sand	0.04	0.46	> 0.05		0.05	0.43
Water Temperature	0.04	0.62	> 0.05		0.005	0.86
B-Sitosterol	> 0.05		> 0.05		> 0.05	
OC-Normalized Resin Acids	> 0.05		> 0.05		> 0.05	

Figure 2 - Taxa Richness
2005 Benthic Macroinvertebrate Sampling
Potlatch Mill, Lewiston Idaho

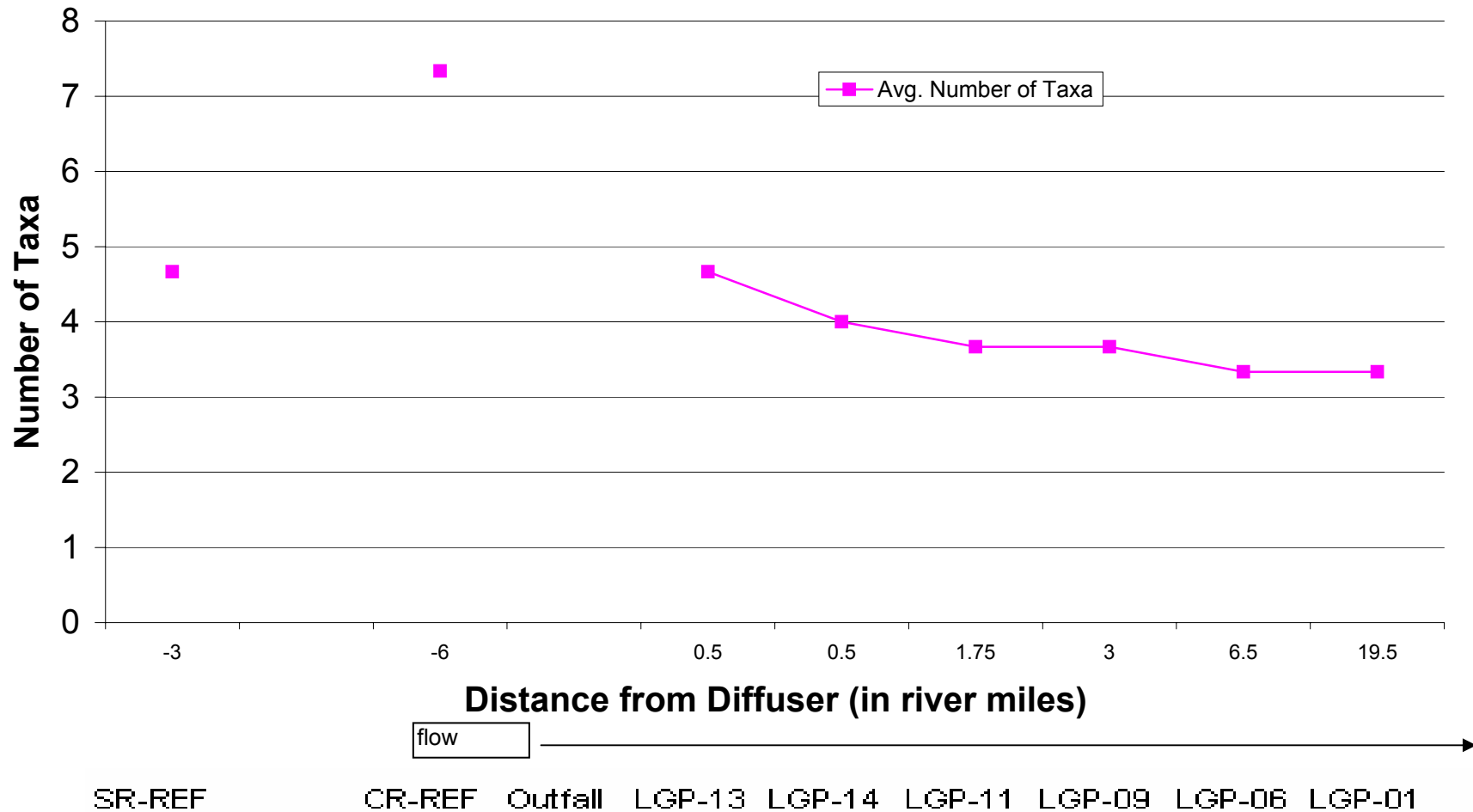


Figure 3 - Abundance
2005 Benthic Macroinvertebrate Sampling
Potlatch Mill, Lewiston Idaho

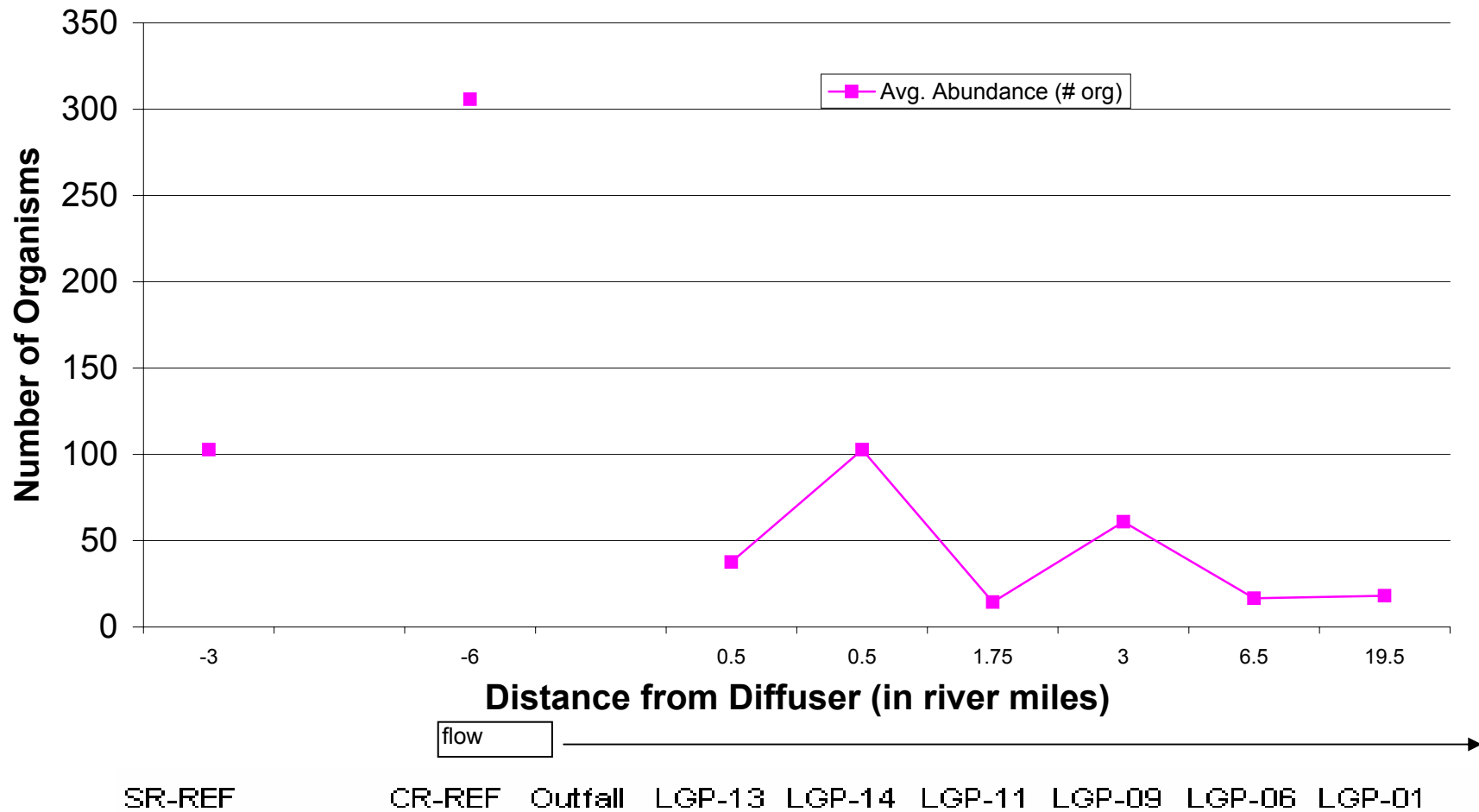


Figure 4 - Tolerance Index
2005 Benthic Macroinvertebrate Sampling
Potlatch Mill Lewiston, Idaho

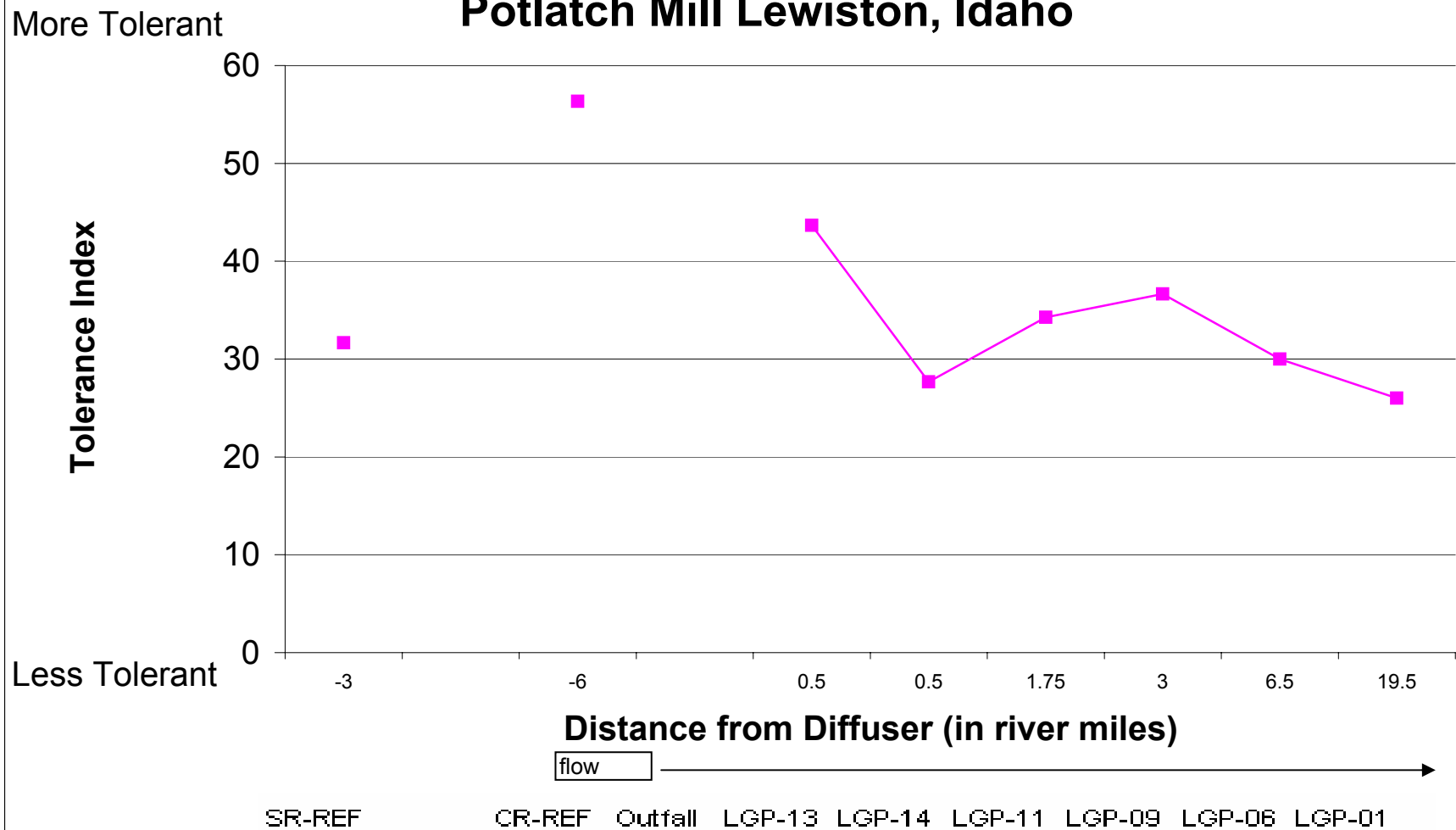


Figure 5 - Location Taxa Richness vs. Distance Downstream
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.628622663
R Square	0.395166453
Adjusted R Square	0.243958066
Standard Error	0.436360586
Observations	6

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	0.497617	0.497617	2.6133898	0.1812713
Residual	4	0.7616422	0.190411		
Total	5	1.2592593			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	4.006201974	0.2273776	17.61916	6.095E-05	3.37489916	4.637505	3.374899	4.637505
X Variable 1	-0.043166777	0.0267022	-1.616598	0.1812713	-0.11730421	0.030971	-0.117304	0.030971

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	3.984618585	0.6820481
2	3.984618585	0.0153814
3	3.930660114	-0.263993
4	3.876701642	-0.210035
5	3.725617922	-0.392285
6	3.164449819	0.1688835

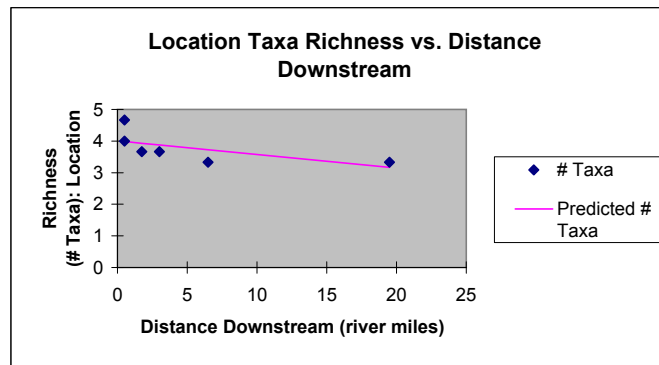


Figure 6 - Replicate Taxa Richness vs. Distance Downstream
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.265921035
R Square	0.070713997
Adjusted R Square	0.012633622
Standard Error	1.107312627
Observations	18

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	1.492851	1.492851	1.2175196	0.28616766
Residual	16	19.61826	1.226141		
Total	17	21.111111			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	4.006201974	0.3331285	12.02599	1.994E-09	3.30000118	4.712403	3.300001	4.712403
X Variable 1	-0.043166777	0.0391212	-1.103413	0.2861677	-0.1260999	0.039766	-0.1261	0.039766

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	3.876701642	-0.876702
2	3.876701642	-0.876702
3	3.876701642	1.1232984
4	3.164449819	0.8355502
5	3.164449819	-0.16445
6	3.164449819	-0.16445
7	3.725617922	-0.725618
8	3.725617922	0.2743821
9	3.725617922	-0.725618
10	3.930660114	1.0693399
11	3.930660114	-0.93066
12	3.930660114	-0.93066
13	3.984618585	3.0153814
14	3.984618585	-0.984619
15	3.984618585	0.0153814
16	3.984618585	-0.984619
17	3.984618585	1.0153814
18	3.984618585	0.0153814

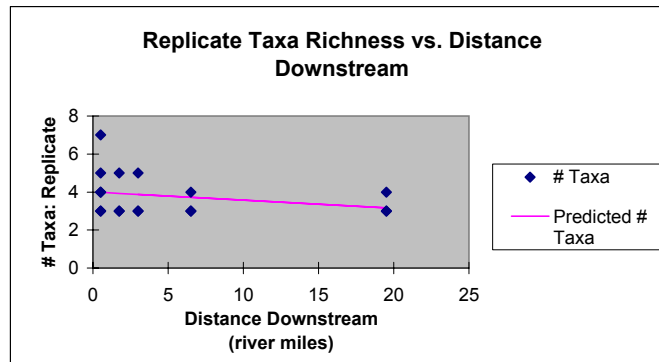


Figure 7 - Location Abundance vs. Distance Downstream
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.462153673
R Square	0.213586017
Adjusted R Square	0.016982522
Standard Error	34.46840994
Observations	6

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	1290.69635	1290.696	1.08637955	0.356124
Residual	4	4752.28513	1188.071		
Total	5	6042.98148			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	53.35561883	17.9607085	2.970686	0.041116347	3.488594	103.2226	3.488594316	103.2226
X Variable 1	-2.198437155	2.10922672	-1.042295	0.356124272	-8.054601	3.657727	-8.054601485	3.657727

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	52.25640025	-14.589734
2	52.25640025	50.4102664
3	49.50835381	-35.17502
4	46.76030737	14.2396926
5	39.06577733	-22.399111
6	10.48609432	7.51390568

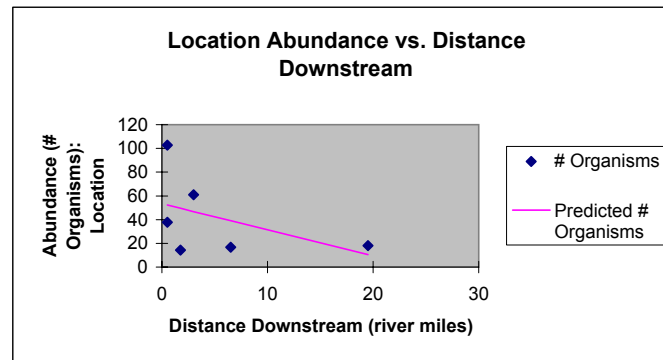


Figure 8 - Replicate Abundance vs. Distance Downstream

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.429589098
R Square	0.184546793
Adjusted R Square	0.133580967
Standard Error	32.70084295
Observations	18

ANOVA

	df	SS	MS	F	Significance F
Regression	1	3872.08904	3872.089	3.620990954	0.075207
Residual	16	17109.5221	1069.345		
Total	17	20981.6111			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	53.35561883	9.83785768	5.4235	5.62975E-05	32.5003	74.21094	32.50029691	74.21094
X Variable 1	-2.198437155	1.1553148	-1.90289	0.075207339	-4.647595	0.25072	-4.64759456	0.25072

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	46.76030737	5.23969263
2	46.76030737	33.2396926
3	46.76030737	4.23969263
4	10.48609432	15.5139057
5	10.48609432	-1.4860943
6	10.48609432	8.51390568
7	39.06577733	-29.065777
8	39.06577733	-22.065777
9	39.06577733	-16.065777
10	49.50835381	-35.508354
11	49.50835381	-31.508354
12	49.50835381	-38.508354
13	52.25640025	7.74359975
14	52.25640025	-29.2564
15	52.25640025	-22.2564
16	52.25640025	45.7435997
17	52.25640025	27.7435997
18	52.25640025	77.7435997

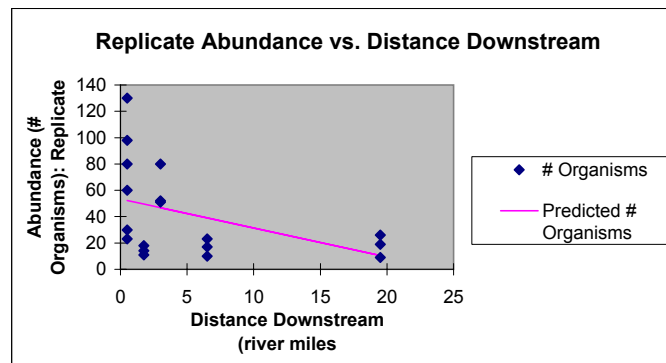


Figure 9 - Location Tolerance Index vs. Distance Downstream
 SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.590286406
R Square	0.348438041
Adjusted R	0.185547551
Standard E	5.9214598
Observatio	6

ANOVA					
	df	SS	MS	F	ignificance F
Regressior	1	75.004515	75.00451	2.139094	0.21741
Residual	4	140.25474	35.06369		
Total	5	215.25926			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	35.84883307	3.0855387	11.61834	0.000314	27.28199	44.41568	27.28199	44.41568
X Variable	-0.529963204	0.3623521	-1.462564	0.21741	-1.536016	0.47609	-1.536016	0.47609

RESIDUAL OUTPUT

Observator	Predicted Y	Residuals
1	35.58385146	8.0828152
2	35.58385146	-7.9171848
3	34.92139746	-0.6547308
4	34.25894345	2.4077232
5	32.40407224	-2.4040722
6	25.51455058	0.4854494

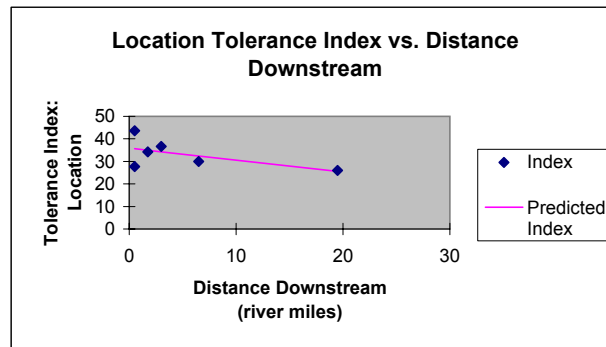


Figure 10 - Replicate Tolerance Index vs. Distance Downstream
SUMMARY OUTPUT

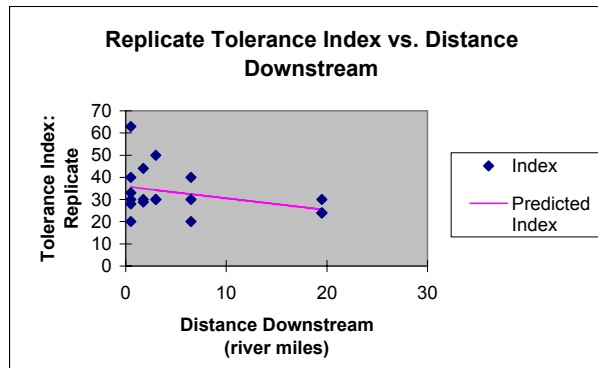
Regression Statistics	
Multiple R	0.335034851
R Square	0.112248351
Adjusted R	0.056763873
Standard E	10.54629941
Observatio	18

ANOVA					
	df	SS	MS	F	ignificance F
Regressor	1	225.01354	225.0135	2.023059	0.174129
Residual	16	1779.5909	111.2244		
Total	17	2004.6044			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	35.84883307	3.1727926	11.29883	4.9E-09	29.12281	42.57485	29.12281	42.57485
X Variable	-0.529963204	0.3725988	-1.422343	0.174129	-1.319837	0.259911	-1.319837	0.259911

RESIDUAL OUTPUT

Observator	Predicted Y	Residuals
1	34.25894345	-4.2589435
2	34.25894345	-4.2589435
3	34.25894345	15.741057
4	25.51455058	4.4854494
5	25.51455058	-1.5145506
6	25.51455058	-1.5145506
7	32.40407224	-12.404072
8	32.40407224	7.5959278
9	32.40407224	-2.4040722
10	34.92139746	9.0786025
11	34.92139746	-4.9213975
12	34.92139746	-6.1213975
13	35.58385146	27.416149
14	35.58385146	-7.5838515
15	35.58385146	4.4161485
16	35.58385146	-15.583851
17	35.58385146	-2.5838515
18	35.58385146	-5.5838515



**Figure 11 - Grain Size Distribution in Sediment Samples
2005 Benthic Macroinvertebrate Sampling
Potlatch Mill, Lewiston Idaho**

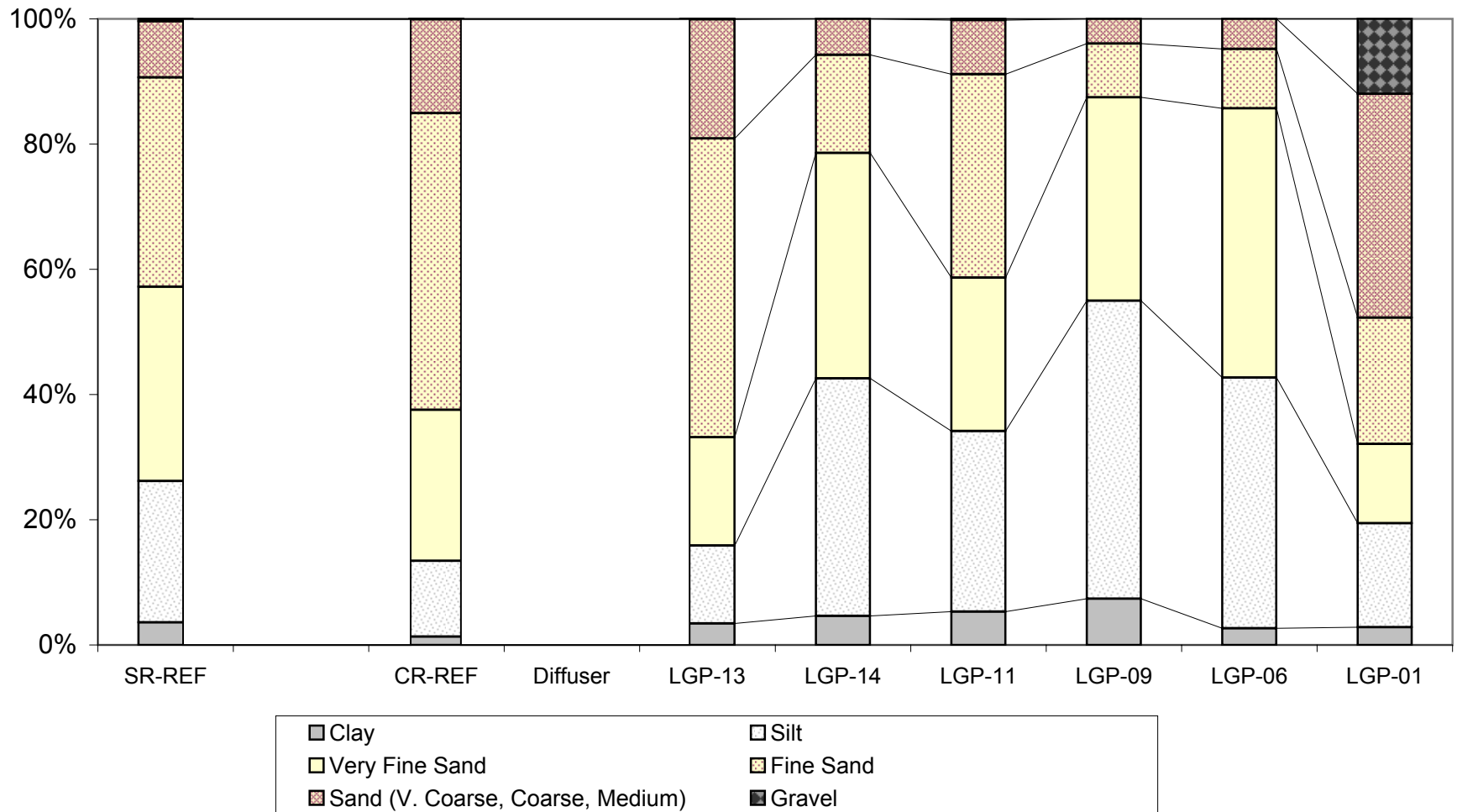


Figure 12 - Taxa Richness vs. % Fine Sand
SUMMARY OUTPUT

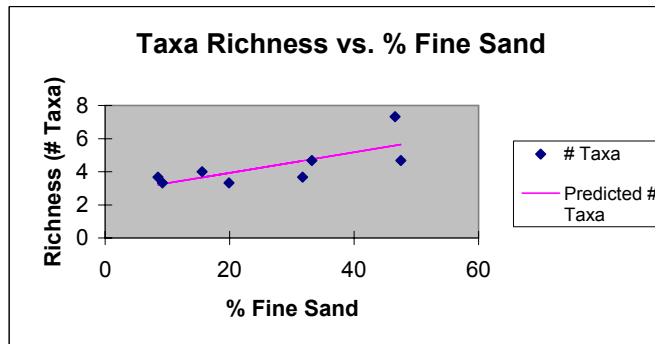
Regression Statistics	
Multiple R	0.732037204
R Square	0.535878468
Adjusted R Square	0.458524879
Standard Error	0.972333662
Observations	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	6.5496257	6.549626	6.9276484	0.03895296
Residual	6	5.6725965	0.945433		
Total	7	12.222222			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	2.688174032	0.7133492	3.768384	0.0093064	0.94267012	4.433678	0.94267	4.433678
X Variable 1	0.062022971	0.0235646	2.632043	0.038953	0.00436249	0.119683	0.004362	0.119683

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	4.747336664	-0.08067
2	5.578444473	1.7548889
3	5.634265146	-0.967598
4	3.655732377	0.3442676
5	4.654302207	-0.987636
6	3.215369284	0.4512974
7	3.258785364	0.074548
8	3.922431152	-0.589098



2005 Benthic Macroinvertebrate Sampling
Potlatch Mill, Lewiston Idaho

Figure 13 - Abundance vs. % Fine Sand
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.476188757
R Square	0.226755732
Adjusted R Square	0.097881688
Standard Error	92.38668375
Observations	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	15017.9818	15017.98	1.759514362	0.232937
Residual	6	51211.796	8535.299		
Total	7	66229.7778			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	3.555233335	67.7791693	0.052453	0.959870361	-162.2945	169.405	-162.2945405	169.405
X Variable 1	2.969956645	2.23899798	1.326467	0.232937462	-2.508678	8.448591	-2.50867805	8.448591

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	102.1577939	0.50887273
2	141.955213	163.711454
3	144.628174	-106.96151
4	49.88655699	52.7801097
5	97.70285897	-83.369526
6	28.79986481	32.2001352
7	30.87883447	-14.212168
8	62.65737056	-44.657371

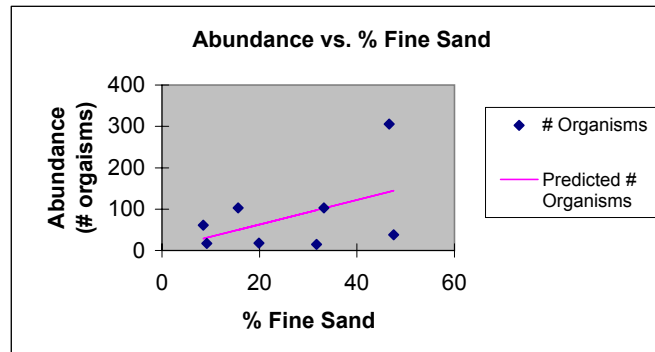


Figure 14 - Tolerance Index vs. % Fine Sand
 SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.715028329
R Square	0.511265512
Adjusted R	0.429809764
Standard E	7.54849282
Observatio	8

ANOVA					
	df	SS	MS	F	ignificance F
Regressor	1	357.63931	357.6393	6.276604	0.046195
Residual	6	341.87846	56.97974		
Total	7	699.51778			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	23.62644737	5.5379255	4.266299	0.005285	10.07562	37.17727	10.07562	37.17727
Percent Fir	0.458318038	0.1829383	2.505315	0.046195	0.010684	0.905952	0.010684	0.905952

RESIDUAL OUTPUT

Observatio	ected Tolerance	Residuals
1	38.84260624	-7.1759396
2	44.98406795	11.349265
3	45.39655418	-1.7298875
4	30.77620877	-3.1095421
5	38.15512918	-3.8884625
6	27.5221507	9.144516
7	27.84297332	2.1570267
8	32.74697633	-6.7469763

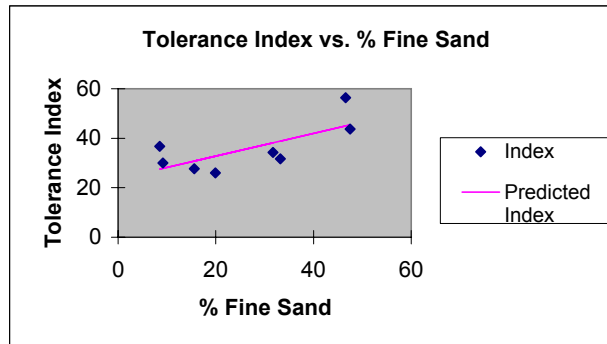


Figure 15 - Taxa Richness vs. Total Organic Carbon
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.571782164
R Square	0.326934843
Adjusted R Square	0.214757317
Standard Error	1.170922138
Observations	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	3.9958703	3.99587	2.9144415	0.13865943
Residual	6	8.2263519	1.371059		
Total	7	12.222222			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	6.043518771	1.0839345	5.575539	0.0014124	3.39122472	8.695813	3.391225	8.695813
X Variable 1	-0.665830422	0.3900192	-1.707174	0.1386594	-1.62017366	0.288513	-1.620174	0.288513

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	4.179193591	0.4874731
2	5.44094224	1.8923911
3	4.565375235	0.1012914
4	4.548729475	-0.548729
5	3.430134367	0.2365323
6	3.190435415	0.4762313
7	4.259093241	-0.92576
8	5.052763104	-1.71943

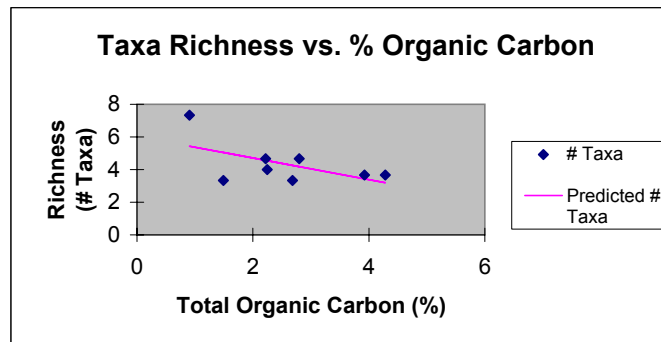


Figure 16 - Abundance vs. Total Organic Carbon
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.549412348
R Square	0.301853928
Adjusted R Sq	0.18549625
Standard Error	87.78578016
Observations	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	19991.7186	19991.72	2.594190017	0.158382
Residual	6	46238.0592	7706.343		
Total	7	66229.7778			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	203.2991264	81.2641852	2.501706	0.046420954	4.452683	402.1456	4.452683077	402.1456
X Variable 1	-47.09588986	29.2403196	-1.610649	0.158382136	-118.6444	24.45265	-118.6444268	24.45265

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	71.43063483	31.2360318
2	160.6773461	144.989321
3	98.74625095	-61.079584
4	97.5688537	5.09781296
5	18.44775874	-4.1144254
6	1.493238386	59.5067616
7	77.08214161	-60.415475
8	133.2204423	-115.22044

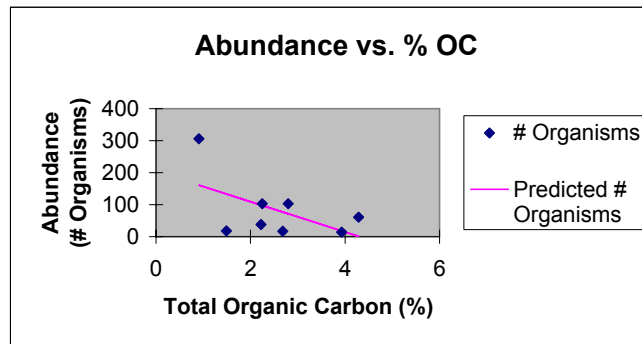


Figure 17 - Tolerance Index vs. Total Organic Carbon
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.325860867
R Square	0.106185305
Adjusted R	-0.042783811
Standard E	10.2081607
Observatio	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	74.278508	74.27851	0.712801	0.430885
Residual	6	625.23927	104.2065		
Total	7	699.51778			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	43.15675548	9.4497977	4.56695	0.003823	20.03392	66.27959	20.03392	66.27959
TOC	-2.870711368	3.4002077	-0.844275	0.430885	-11.19073	5.449303	-11.19073	5.449303

RESIDUAL OUTPUT

Observation	Corrected Tolerance	Residuals
1	35.11876365	-3.452097
2	40.55876169	15.774572
3	36.78377625	6.8828904
4	36.71200846	-9.0453418
5	31.88921336	2.3774533
6	30.85575727	5.8109094
7	35.46324902	-5.463249
8	38.88513697	-12.885137

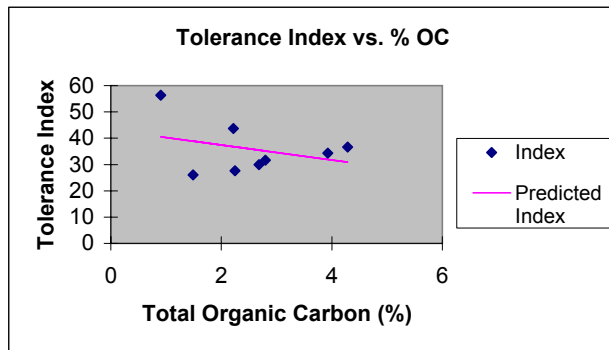


Figure 18 - Taxa Richness vs. Retene
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.516985641
R Square	0.267274153
Adjusted R Square	0.145153178
Standard Error	1.221715879
Observations	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	3.2666841	3.266684	2.1886015	0.18952388
Residual	6	8.9555381	1.49259		
Total	7	12.222222			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	5.251015314	0.7558825	6.946867	0.0004413	3.40143615	7.100594	3.401436	7.100594
X Variable 1	-0.005364601	0.0036262	-1.479392	0.1895239	-0.01423765	0.003508	-0.014238	0.003508

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	4.680221816	-0.013555
2	5.136749322	2.196584
3	4.62174767	0.044919
4	3.909865178	0.0901348
5	3.947417382	-0.280751
6	3.184034724	0.4826319
7	4.03056869	-0.697235
8	5.156061884	-1.822729

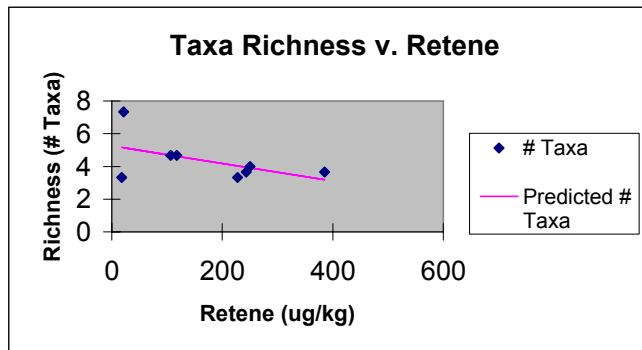


Figure 19 - Abundance v. Retene
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.392795145
R Square	0.154288026
Adjusted R Square	0.01333603
Standard Error	96.61893888
Observations	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	10218.4617	10218.46	1.094613988	0.335757
Residual	6	56011.3161	9335.219		
Total	7	66229.7778			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	133.6586214	59.778681	2.235891	0.066723031	-12.61465	279.9319	-12.61464851	279.9319
X Variable 1	-0.30003822	0.28677817	-1.046238	0.335757184	-1.00176	0.401683	-1.001759628	0.401683

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	101.7345548	0.93211191
2	127.2678073	178.398859
3	98.46413816	-60.797471
4	58.64906631	44.0176004
5	60.74933386	-46.416001
6	18.0538951	42.9461049
7	65.39992627	-48.73326
8	128.3479449	-110.34794

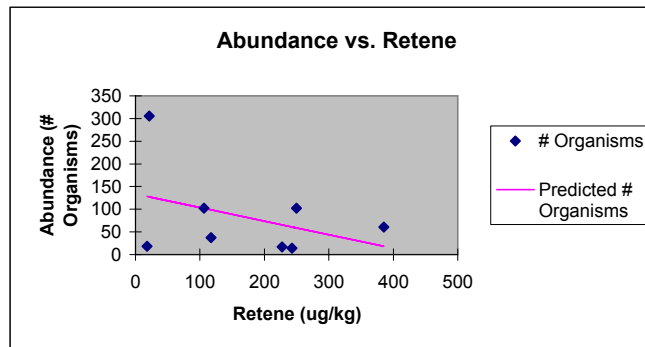


Figure 20 - Tolerance Index v. Retene
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.294230807
R Square	0.086571768
Adjusted R	-0.065666271
Standard E	10.31955496
Observatio	8

ANOVA					
	df	SS	MS	F	ignificance F
Regressior	1	60.558491	60.55849	0.568661	0.47933
Residual	6	638.95929	106.4932		
Total	7	699.51778			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	39.73450734	6.3847667	6.22333	0.000796	24.11153	55.35748	24.11153	55.35748
X Variable	-0.023097839	0.0306298	-0.754096	0.47933	-0.098046	0.051851	-0.098046	0.051851

RESIDUAL OUTPUT

Observator	Predicted Y	Residuals
1	37.27689732	-5.6102307
2	39.24252338	17.09081
3	37.02513088	6.6415358
4	33.9600477	-6.293381
5	34.12173257	0.1449341
6	30.83491015	5.8317565
7	34.47974907	-4.4797491
8	39.3256756	-13.325676

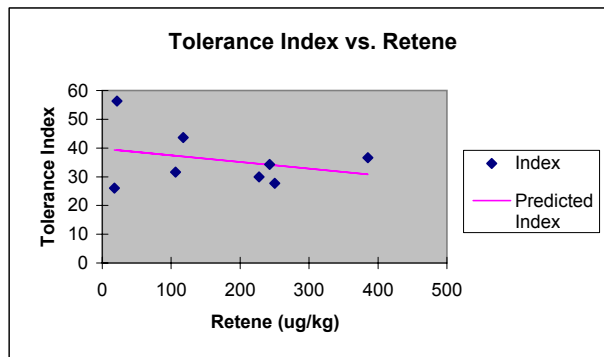


Figure 21 - Taxa Richness v. Retene-OC
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.4206741
R Square	0.176966698
Adjusted R Square	0.039794481
Standard Error	1.294816326
Observations	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	2.1629263	2.162926	1.290106	0.29935232
Residual	6	10.059296	1.676549		
Total	7	12.222222			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	5.288720681	0.9576431	5.522643	0.0014833	2.94545074	7.631991	2.945451	7.631991
X Variable 1	-0.016112964	0.0141861	-1.135828	0.2993523	-0.0508251	0.018599	-0.050825	0.018599

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	4.676428063	-0.009761
2	4.909487393	2.4238459
3	4.437346522	0.2293201
4	3.494404019	0.505596
5	4.291153761	-0.624487
6	3.839870066	-0.173203
7	3.920922463	-0.587589
8	5.09705438	-1.763721

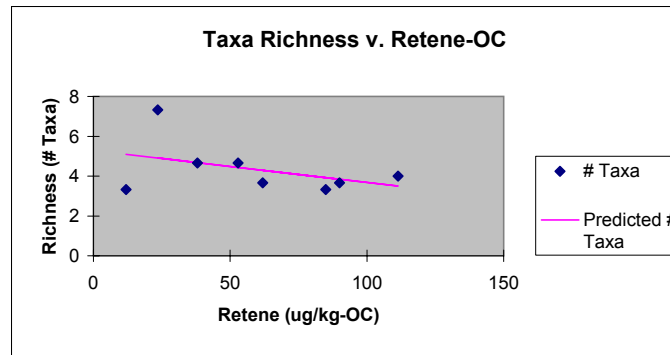


Figure 22 - Abundance v. Retene-OC
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.278191077
R Square	0.077390276
Adjusted R Square	-0.076378012
Standard Error	100.9160022
Observations	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	5125.54075	5125.541	0.503291523	0.504679
Residual	6	61104.237	10184.04		
Total	7	66229.7778			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	128.8414196	74.6372365	1.726235	0.135055802	-53.78945	311.4723	-53.78945259	311.4723
X Variable 1	-0.784376205	1.10564219	-0.70943	0.504678526	-3.489787	1.921035	-3.489787164	1.921035

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	99.0351238	3.63154286
2	110.3804106	195.286256
3	87.39667686	-49.73001
4	41.49440341	61.1722633
5	80.28003925	-65.946706
6	58.31162919	2.68837081
7	62.25724545	-45.590579
8	119.5111381	-101.51114

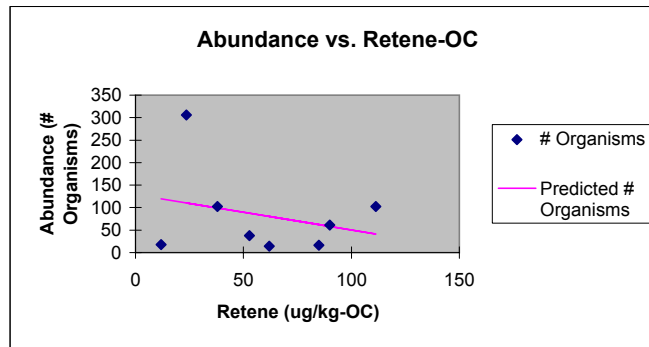


Figure 23 - Tolerance Index v. Retene-oc
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.323885426
R Square	0.104901769
Adjusted R	-0.044281269
Standard E	10.21548763
Observatio	8

ANOVA					
	df	SS	MS	F	ignificance F
Regressior	1	73.380652	73.38065	0.703175	0.433848
Residual	6	626.13713	104.3562		
Total	7	699.51778			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	41.34813139	7.5553505	5.472695	0.001554	22.86084	59.83542	22.86084	59.83542
X Variable	-0.093852393	0.1119215	-0.838555	0.433848	-0.367715	0.18001	-0.367715	0.18001

RESIDUAL OUTPUT

Observator	Predicted Y	Residuals
1	37.78174046	-6.1150738
2	39.13922977	17.194104
3	36.38917388	7.2774928
4	30.8968627	-3.230196
5	35.53765204	-1.2709854
6	32.90908193	3.7575847
7	33.38118386	-3.3811839
8	40.23174204	-14.231742

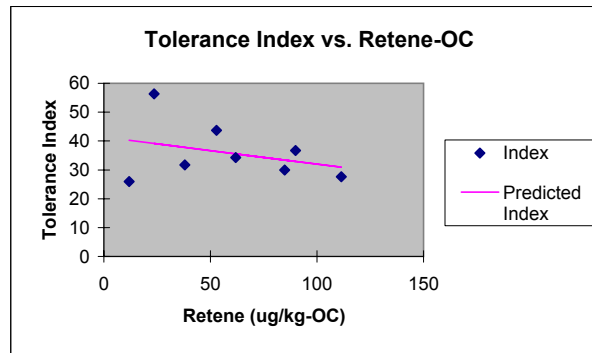


Figure 24 - Taxa Richness vs. Resin Acids
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.235541428
R Square	0.055479764
Adjusted R Square	-0.101940275
Standard Error	1.387091454
Observations	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	0.678086	0.678086	0.3524314	0.57442268
Residual	6	11.544136	1.924023		
Total	7	12.222222			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	4.753747047	0.8614014	5.51862	0.0014888	2.64597227	6.861522	2.645972	6.861522
X Variable 1	-9.17544E-05	0.0001546	-0.593659	0.5744227	-0.00046994	0.000286	-0.00047	0.000286

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	4.365134851	0.3015318
2	4.596344588	2.7369887
3	4.102230835	0.5644358
4	4.490966899	-0.490967
5	3.698995274	-0.032329
6	4.327731151	-0.661064
7	4.401891682	-1.068558
8	4.683371386	-1.350038

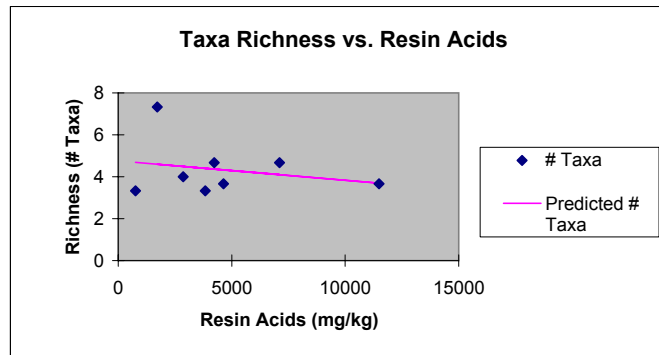


Figure 25 - Abundance vs. Resin Acids
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.420666241
R Square	0.176960086
Adjusted R Square	0.039786767
Standard Error	95.31504831
Observations	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	11720.0272	11720.03	1.290047419	0.299362
Residual	6	54509.7506	9084.958		
Total	7	66229.7778			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	137.6045205	59.1918533	2.324721	0.059065997	-7.232833	282.4419	-7.232832671	282.4419
X Variable 1	-0.012062825	0.01062053	-1.135803	0.2993623	-0.03805	0.013925	-0.038050346	0.013925

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	86.5142332	16.1524335
2	116.9110452	188.755621
3	51.95061978	-14.283953
4	103.0571919	-0.3905252
5	-1.062180266	15.3955136
6	81.59682245	-20.596822
7	91.34660103	-74.679934
8	128.3523334	-110.35233

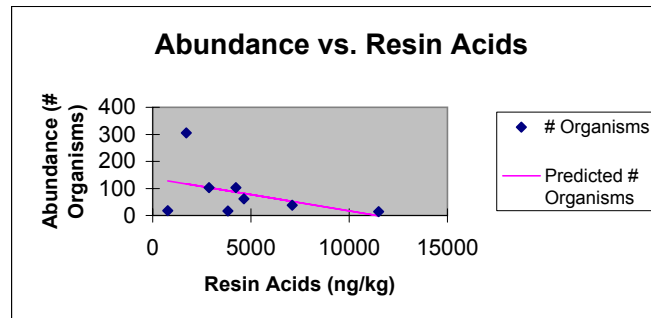


Figure 26 - Tolerance Index vs. Resin Acids

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.031739288
R Square	0.001007382
Adjusted R	-0.165491387
Standard E	10.79207345
Observatio	8

ANOVA

	df	SS	MS	F	ignificance F
Regressior	1	0.7046819	0.704682	0.00605	0.940529
Residual	6	698.8131	116.4688		
Total	7	699.51778			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	35.35475418	6.7020144	5.275243	0.001874	18.9555	51.754	18.9555	51.754
Total Resir	9.35365E-05	0.0012025	0.077784	0.940529	-0.002849	0.003036	-0.002849	0.003036

RESIDUAL OUTPUT

Observatio	ected Tolerance	Residuals
1	35.75091415	-4.0842475
2	35.51521377	20.81812
3	36.01892439	7.6477423
4	35.62263815	-7.9559715
5	36.42999175	-2.1633251
6	35.78904432	0.8776223
7	35.71344342	-5.7134434
8	35.4264967	-9.4264967

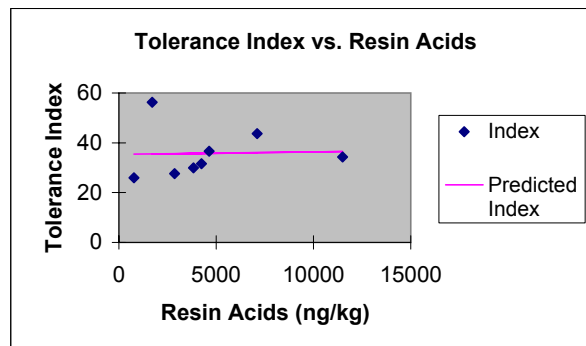


Figure 27 - Taxa Richness vs. Resin Acids-OC
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.26127325
R Square	0.068263711
Adjusted R Square	-0.08702567
Standard Error	1.377672432
Observations	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	0.8343342	0.834334	0.4395903	0.53195044
Residual	6	11.387888	1.897981		
Total	7	12.222222			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	3.680339136	1.098747	3.349578	0.0154274	0.99180016	6.368878	0.9918	6.368878
X Variable 1	0.000377426	0.0005693	0.663016	0.5319504	-0.00101549	0.00177	-0.001015	0.00177

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	4.251242798	0.4154239
2	4.395769501	2.9375638
3	4.887532074	-0.220865
4	4.161821784	-0.161822
5	4.785727877	-1.119061
6	4.089297799	-0.422631
7	4.220388945	-0.887056
8	3.874885889	-0.541553

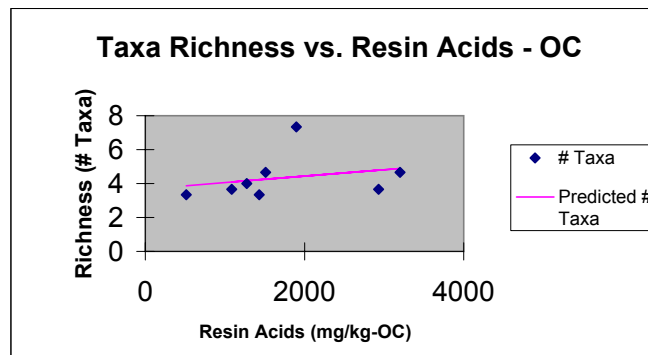


Figure 28 - Abundance vs. Resin Acids-OC
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.019625295
R Square	0.000385152
Adjusted R Square	-0.166217322
Standard Error	105.043062
Observations	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	25.5085458	25.50855	0.002311804	0.963212
Residual	6	66204.2692	11034.04		
Total	7	66229.7778			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	85.94395627	83.7758996	1.025879	0.344517241	-119.0484	290.9363	-119.0484353	290.9363
X Variable 1	-0.002086913	0.04340391	-0.048081	0.963212019	-0.108293	0.104119	-0.108292542	0.104119

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	82.78723931	19.8794274
2	81.98810292	223.678564
3	79.26898346	-41.602317
4	83.28167795	19.3849887
5	79.83189285	-65.49856
6	83.68268728	-22.682687
7	82.95784057	-66.291174
8	84.86824232	-66.868242

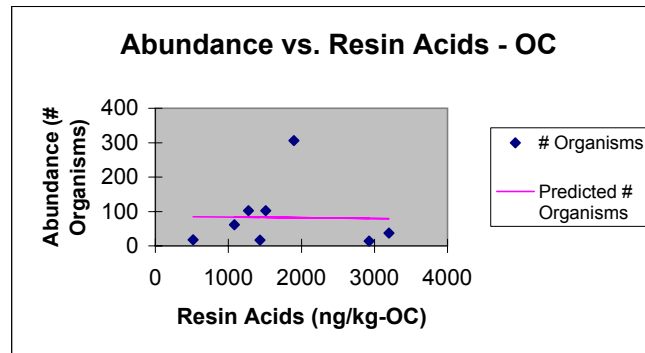


Figure 29 - Tolerance Index vs. Resin Acids-OC
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.480936135
R Square	0.231299566
Adjusted R	0.103182827
Standard E	9.466780685
Observatio	8

ANOVA					
	df	SS	MS	F	ignificance F
Regressor	1	161.79816	161.7982	1.805381	0.227646
Residual	6	537.71962	89.61994		
Total	7	699.51778			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	26.68993796	7.5501233	3.535033	0.012293	8.215438	45.16444	8.215438	45.16444
Resin Acid	0.005255915	0.0039117	1.343645	0.227646	-0.004316	0.014827	-0.004316	0.014827

RESIDUAL OUTPUT

Observatio	ected Tolerance	Residuals
1	34.6401659	-2.9734992
2	36.6528001	19.680533
3	43.50093372	0.1657329
4	33.39491651	-5.7282498
5	42.08323993	-7.8165733
6	32.3849699	4.2816968
7	34.21050468	-4.2105047
8	29.39913592	-3.3991359

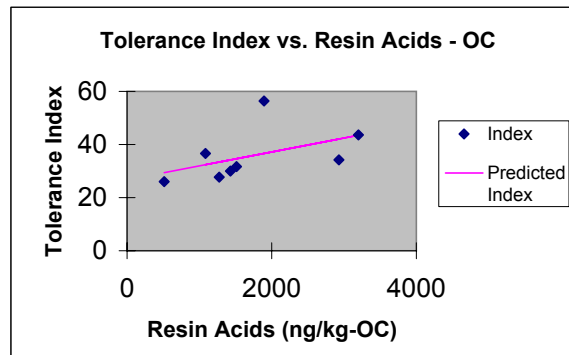


Figure 30 - Taxa Richness v. B-Sitosterol
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.415439348
R Square	0.172589852
Adjusted R Square	0.03468816
Standard Error	1.298254643
Observations	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	2.1094315	2.109432	1.2515427	0.30603644
Residual	6	10.112791	1.685465		
Total	7	12.222222			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	5.290876107	0.9712309	5.447598	0.001591	2.91435788	7.667394	2.914358	7.667394
X Variable 1	-3.05235E-05	2.728E-05	-1.118724	0.3060364	-9.7286E-05	3.62E-05	-9.73E-05	3.62E-05

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	4.243155327	0.4235113
2	4.979993772	2.3533396
3	4.353803188	0.3128635
4	4.494211508	-0.494212
5	3.499143847	0.1675228
6	3.692968376	-0.026302
7	4.327858172	-0.994525
8	5.075532477	-1.742199

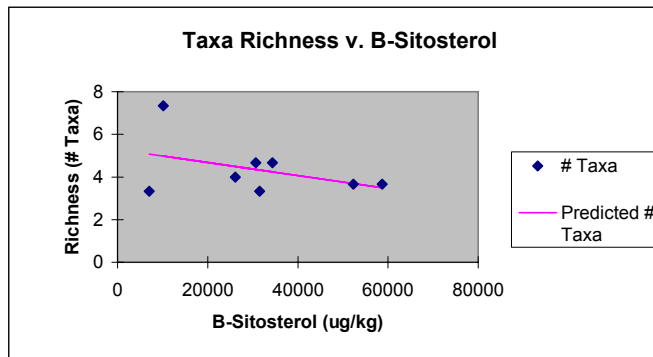


Figure 31 - Abundance v. B-Sitosterol
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.449312604
R Square	0.201881816
Adjusted R Square	0.068862119
Standard Error	93.86088106
Observations	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	13370.5878	13370.59	1.517683622	0.264057
Residual	6	52859.19	8809.865		
Total	7	66229.7778			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	158.5676862	70.2178051	2.258226	0.064705629	-13.24922	330.3846	-13.24921884	330.3846
X Variable 1	-0.002430119	0.00197259	-1.231943	0.264056809	-0.007257	0.002397	-0.007256877	0.002397

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	75.15385042	27.5128162
2	133.8169238	171.849743
3	83.96303191	-46.296365
4	95.14157945	7.52508721
5	15.91969904	-1.5863657
6	31.35095488	29.6490451
7	81.89743073	-65.230764
8	141.4231964	-123.4232

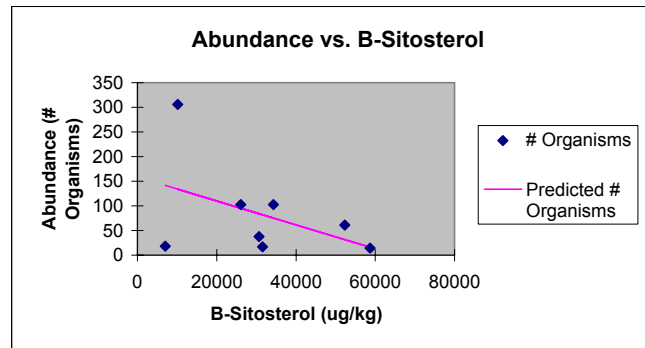


Figure 32 - Tolerance Index v. B-Sitosterol
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.155823352
R Square	0.024280917
Adjusted R	-0.13833893
Standard E	10.66562113
Observatio	8

ANOVA					
	df	SS	MS	F	ignificance F
Regressior	1	16.984933	16.98493	0.149311	0.712526
Residual	6	682.53284	113.7555		
Total	7	699.51778			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	38.50044438	7.9790057	4.825218	0.002924	18.97651	58.02438	18.97651	58.02438
X Variable	-8.66132E-05	0.0002241	-0.386408	0.712526	-0.000635	0.000462	-0.000635	0.000462

RESIDUAL OUTPUT

Observator	Predicted Y	Residuals
1	35.52744538	-3.8607787
2	37.61828867	18.715045
3	35.84141833	7.8252483
4	36.23983917	-8.5731725
5	33.41624799	0.8504187
6	33.96624198	2.7004247
7	35.76779709	-5.7677971
8	37.88938806	-11.889388

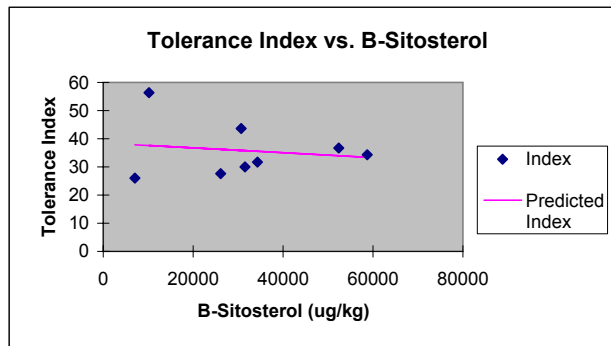


Figure 33 - Taxa Richness vs. B-Sitosterol-OC
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.141136398
R Square	0.019919483
Adjusted R Square	-0.14342727
Standard Error	1.41296154
Observations	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	0.2434603	0.24346	0.121946	0.73886246
Residual	6	11.978762	1.99646		
Total	7	12.222222			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	3.620291184	2.1021072	1.72222	0.1358072	-1.52338361	8.763966	-1.523384	8.763966
X Variable 1	6.15661E-05	0.0001763	0.349208	0.7388625	-0.00036983	0.000493	-0.00037	0.000493

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	4.375025837	0.2916408
2	4.313165129	3.0201682
3	4.471678503	0.1949882
4	4.336048735	-0.336049
5	4.54103798	-0.874371
6	4.372446685	-0.70578
7	4.345071426	-1.011738
8	3.912192372	-0.578859

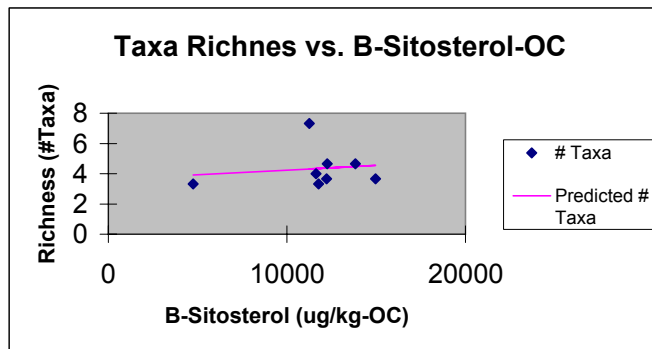


Figure 34 - Abundance vs. B-Sitosterol-OC
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.012470919
R Square	0.000155524
Adjusted R Square	-0.166485222
Standard Error	105.0551264
Observations	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	10.3003076	10.30031	0.000933288	0.976619
Residual	6	66219.4775	11036.58		
Total	7	66229.7778			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	77.69538206	156.293807	0.497111	0.636798502	-304.7421	460.1328	-304.7420659	460.1328
X Variable 1	0.000400454	0.01310826	0.03055	0.976619452	-0.031674	0.032475	-0.031674316	0.032475

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	82.60452039	20.0621463
2	82.20215014	223.464517
3	83.2331934	-45.566527
4	82.35099554	20.3156711
5	83.68433907	-69.351006
6	82.58774441	-21.587744
7	82.40968324	-65.743017
8	79.59404049	-61.59404

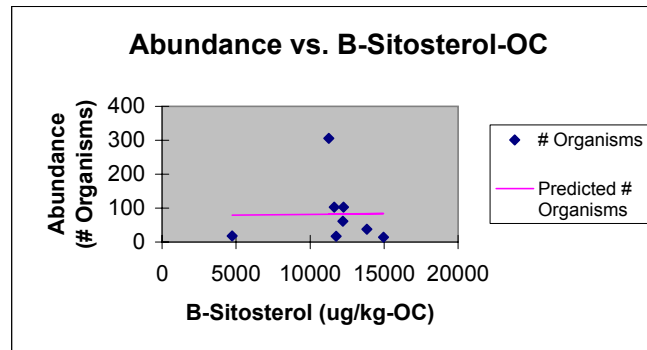


Figure 35 - Tolerance Index vs. B-Sitosterol-OC

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.325997671
R Square	0.106274482
Adjusted R	-0.042679771
Standard E	10.20765145
Observatio	8

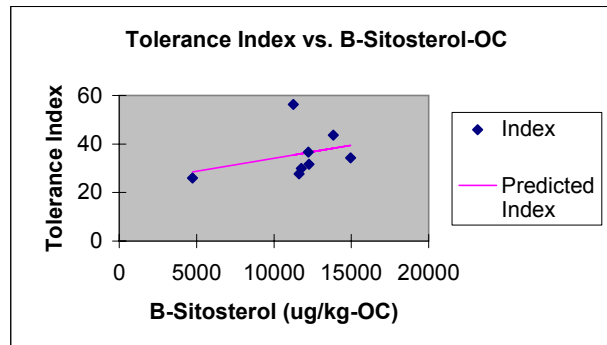
ANOVA

	df	SS	MS	F	ignificance F
Regressior	1	74.340889	74.34089	0.713471	0.43068
Residual	6	625.17689	104.1961		
Total	7	699.51778			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	23.32342176	15.186243	1.535826	0.175487	-13.836	60.48285	-13.836	60.48285
B-sitostero	0.001075825	0.0012737	0.844672	0.43068	-0.002041	0.004192	-0.002041	0.004192

RESIDUAL OUTPUT

Observatio	ected Tolerance	Residuals
1	36.5118806	-4.8452139
2	35.4309081	20.902425
3	38.20081816	5.4658485
4	35.83078307	-8.1641164
5	39.41282639	-5.1461597
6	36.46681172	0.1998549
7	35.98844827	-5.9884483
8	28.42419034	-2.4241903



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Figure 36 - Taxa Richness v. TCDF
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.52690959
R Square	0.277633716
Adjusted R Square	0.157239335
Standard Error	1.213048587
Observations	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	3.393301	3.393301	2.3060355	0.17967393
Residual	6	8.8289213	1.471487		
Total	7	12.222222			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	5.244636829	0.7376086	7.110325	0.000389	3.43977218	7.049501	3.439772	7.049501
X Variable 1	-3.925917052	2.5852832	-1.518564	0.1796739	-10.2518818	2.400048	-10.25188	2.400048

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	4.687156608	-0.02049
2	5.107229732	2.2261036
3	4.746045363	-0.079379
4	3.933380534	0.0666195
5	2.838049676	0.828617
6	4.455527502	-0.788861
7	4.624341935	-1.291009
8	4.274935317	-0.941602

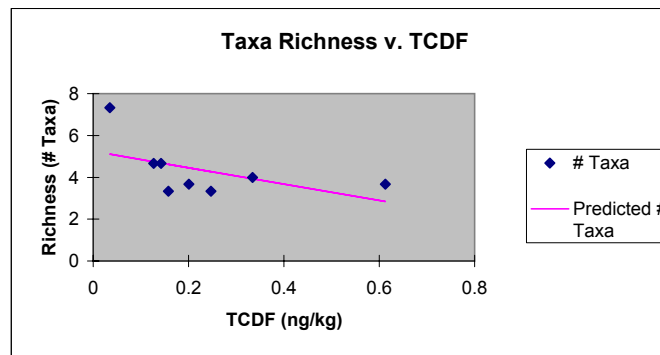


Figure 37 - Abundance v. TCDF
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.500320225
R Square	0.250320328
Adjusted R Square	0.125373716
Standard Error	90.96805124
Observations	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	16578.6597	16578.66	2.003418292	0.206694
Residual	6	49651.1181	8275.186		
Total	7	66229.7778			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	146.0314444	55.3142071	2.640035	0.038538635	10.68236	281.3805	10.68235668	281.3805
X Variable 1	-274.4129719	193.873665	-1.415422	0.206693657	-748.8051	199.9791	-748.8050868	199.9791

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	107.0648024	-4.3981358
2	136.4269904	169.239676
3	111.180997	-73.51433
4	54.37751182	48.2891548
5	-22.18370733	36.5170407
6	90.87443708	-29.874437
7	102.6741949	-86.007528
8	78.25144038	-60.25144

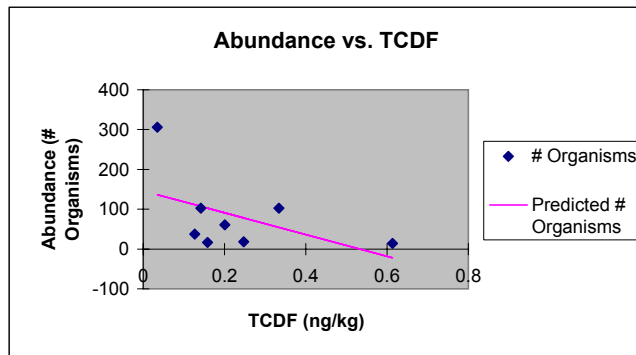


Figure 38 - Tolerance Index v. TCDF

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.455886144
R Square	0.207832176
Adjusted R	0.075804206
Standard E	9.610198365
Observatio	8

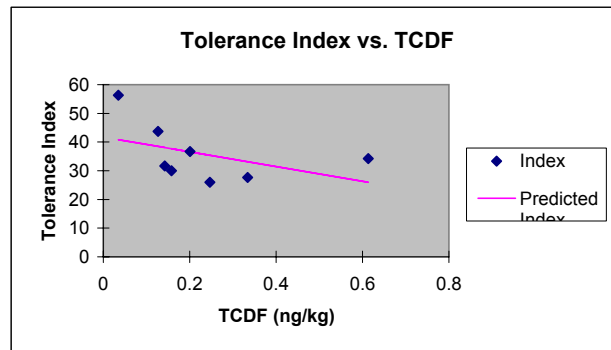
ANOVA

	df	SS	MS	F	ignificance F
Regression	1	145.3823	145.3823	1.574153	0.256264
Residual	6	554.13548	92.35591		
Total	7	699.51778			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	41.74829444	5.8435956	7.144282	0.000379	27.44952	56.04707	27.44952	56.04707
X Variable	-25.69719378	20.481525	-1.254652	0.256264	-75.81372	24.41933	-75.81372	24.41933

RESIDUAL OUTPUT

Observator	Predicted Y	Residuals
1	38.09929292	-6.4326263
2	40.84889266	15.484441
3	38.48475083	5.1819158
4	33.16543172	-5.4987651
5	25.99591465	8.270752
6	36.58315849	0.0835082
7	37.68813782	-7.6881378
8	35.40108758	-9.4010876



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Figure 39 - Taxa Richness vs. TCDF-OC
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.52690959
R Square	0.277633716
Adjusted R Square	0.157239335
Standard Error	1.213048587
Observations	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	3.393301	3.393301	2.3060355	0.17967393
Residual	6	8.8289213	1.471487		
Total	7	12.222222			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	5.244636829	0.7376086	7.110325	0.000389	3.43977218	7.049501	3.439772	7.049501
X Variable 1	-3.925917052	2.5852832	-1.518564	0.1796739	-10.2518818	2.400048	-10.25188	2.400048

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	4.687156608	-0.02049
2	5.107229732	2.2261036
3	4.746045363	-0.079379
4	3.933380534	0.0666195
5	2.838049676	0.828617
6	4.455527502	-0.788861
7	4.624341935	-1.291009
8	4.274935317	-0.941602

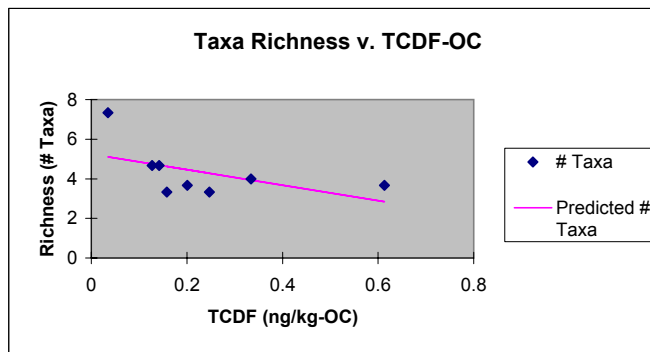


Figure 40 - Abundance v. TCDF-OC
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.500320225
R Square	0.250320328
Adjusted R Square	0.125373716
Standard Error	90.96805124
Observations	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	16578.6597	16578.66	2.003418292	0.206694
Residual	6	49651.1181	8275.186		
Total	7	66229.7778			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	146.0314444	55.3142071	2.640035	0.038538635	10.68236	281.3805	10.68235668	281.3805
X Variable 1	-274.4129719	193.873665	-1.415422	0.206693657	-748.8051	199.9791	-748.8050868	199.9791

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	107.0648024	-4.3981358
2	136.4269904	169.239676
3	111.180997	-73.51433
4	54.37751182	48.2891548
5	-22.18370733	36.5170407
6	90.87443708	-29.874437
7	102.6741949	-86.007528
8	78.25144038	-60.25144

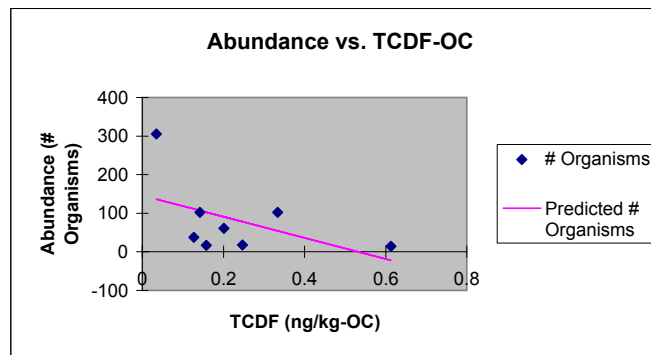


Figure 41 - Tolerance Index v. TCDF-OC
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.455886144
R Square	0.207832176
Adjusted R	0.075804206
Standard E	9.610198365
Observatio	8

ANOVA					
	df	SS	MS	F	ignificance F
Regression	1	145.3823	145.3823	1.574153	0.256264
Residual	6	554.13548	92.35591		
Total	7	699.51778			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	41.74829444	5.8435956	7.144282	0.000379	27.44952	56.04707	27.44952	56.04707
X Variable	-25.69719378	20.481525	-1.254652	0.256264	-75.81372	24.41933	-75.81372	24.41933

RESIDUAL OUTPUT

Observator	Predicted Y	Residuals
1	38.09929292	-6.4326263
2	40.84889266	15.484441
3	38.48475083	5.1819158
4	33.16543172	-5.4987651
5	25.99591465	8.270752
6	36.58315849	0.0835082
7	37.68813782	-7.6881378
8	35.40108758	-9.4010876

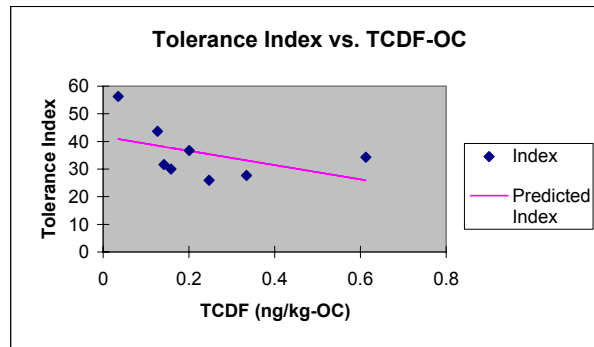


Figure 42 - Taxa Richness vs. Water Temperature
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.833607868
R Square	0.694902077
Adjusted R Square	0.618627596
Standard Error	0.93656635
Observations	6

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	7.9913739	7.991374	9.1105448	0.03922612
Residual	4	3.5086261	0.877157		
Total	5	11.5			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	11.44348687	2.3319699	4.907219	0.0080024	4.96888698	17.91809	4.968887	17.91809
X Variable 1	-0.402024112	0.1331925	-3.018368	0.0392261	-0.77182668	-0.032222	-0.771827	-0.032222

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	3.21740349	1.4492632
2	6.809488934	0.5238444
3	4.888316207	-0.22165
4	4.337375663	-0.670709
5	4.033177418	-0.699844
6	3.714238289	-0.380905

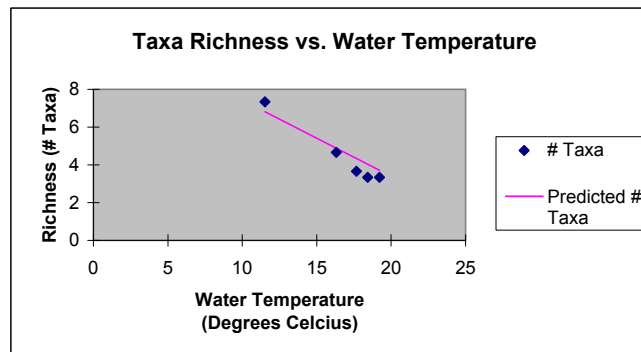


Figure 43 - Abundance vs. Water Temperature
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.799046823
R Square	0.638475826
Adjusted R Square	0.548094782
Standard Error	74.13771635
Observations	6

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	38828.0442	38828.04	7.06426702	0.056516
Residual	4	21985.6039	5496.401		
Total	5	60813.6481			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	574.2714138	184.596558	3.110954	0.035838782	61.74814	1086.795	61.74814236	1086.795
X Variable 1	-28.02296823	10.5433975	-2.657869	0.056515805	-57.29619	1.250257	-57.29619329	1.250257

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	0.874778935	101.791888
2	251.26	54.4066666
3	117.3452406	-79.678574
4	78.94209792	-17.942098
5	57.73805196	-41.071385
6	35.50649717	-17.506497

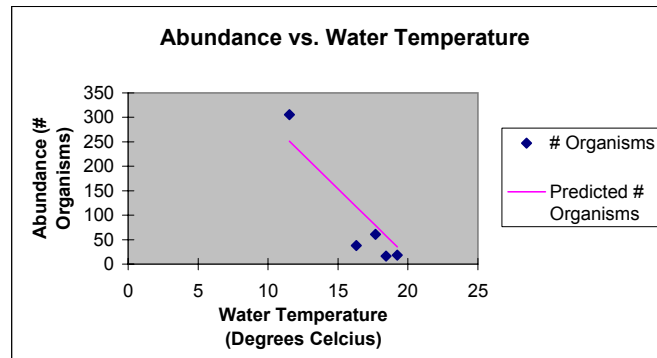


Figure 44 - Abundance vs. Water Temperature at Snake River Locations
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.953801522
R Square	0.909737343
Adjusted R Square	0.879649791
Standard Error	42.71056364
Observations	5

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	55156.8899	55156.89	30.23633613	0.011837
Residual	3	5472.57674	1824.192		
Total	4	60629.4667			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	728.0180784	117.98596	6.170379	0.008568856	352.5337	1103.502	352.5337428	1103.502
X Variable 1	-38.49025767	6.99980975	-5.498758	0.011837029	-60.7668	-16.21372	-60.76679723	-16.21372

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	284.3537083	21.3129584
2	100.4183895	-62.751723
3	47.67069886	13.3293011
4	18.54640389	-1.8797372
5	-11.98920053	29.9892005

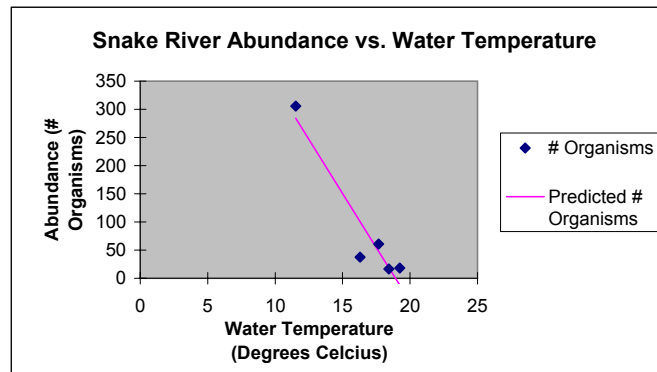


Figure 45 - Tolerance Index vs. Water Temperature

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.623307464
R Square	0.388512194
Adjusted R	0.235640243
Standard E	16.55304069
Observatio	6

ANOVA					
	df	SS	MS	F	ignificance F
Regressior	1	696.35775	696.3577	2.541422	0.18612
Residual	4	1096.0126	274.0032		
Total	5	1792.3704			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	102.7050192	41.215652	2.491894	0.067348	-11.72821	217.1383	-11.72821	217.1383
X Variable	-3.752818682	2.3540688	-1.594184	0.18612	-10.28878	2.783138	-10.28878	2.783138

RESIDUAL OUTPUT

Observator	Predicted Y	Residuals
1	25.91609423	5.7505724
2	59.44752916	-3.1141958
3	41.51374688	2.1529198
4	36.37082161	24.629178
5	33.53118881	-16.864522
6	30.55395265	-12.553953

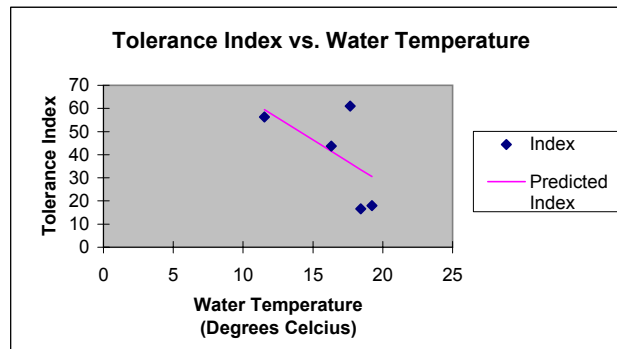


Figure 46 - Tolerance Index vs. Water Temperature at Snake River Locations
 SUMMARY OUTPUT

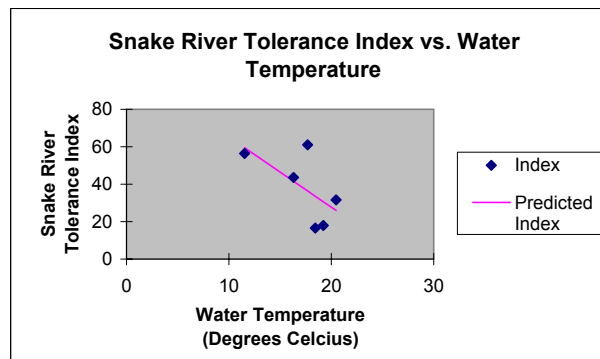
Regression Statistics	
Multiple R	0.623307464
R Square	0.388512194
Adjusted R	0.235640243
Standard E	16.55304069
Observatio	6

ANOVA					
	df	SS	MS	F	ignificance F
Regressior	1	696.35775	696.3577	2.541422	0.18612
Residual	4	1096.0126	274.0032		
Total	5	1792.3704			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	102.7050192	41.215652	2.491894	0.067348	-11.72821	217.1383	-11.72821	217.1383
X Variable	-3.752818682	2.3540688	-1.594184	0.18612	-10.28878	2.783138	-10.28878	2.783138

RESIDUAL OUTPUT

Observator	Predicted Y	Residuals
1	59.44752916	-3.1141958
2	41.51374688	2.1529198
3	36.37082161	24.629178
4	33.53118881	-16.864522
5	30.55395265	-12.553953
6	25.91609423	5.7505724



APPENDIX A
TAXONOMY DATA



Aquatec Biological Sciences

 Ecology Environmental Toxicology Natural Resource Assessments Microbiology

December 31, 2005

1-978-692-6633

Potlatch

Mr. Shaun Hinz
Anchor Environmental
1423 3rd Ave. Ste. 300
Seattle, WA 98101

RE: Anchor Project 050297-1T4; Macroinvertebrate Taxonomy

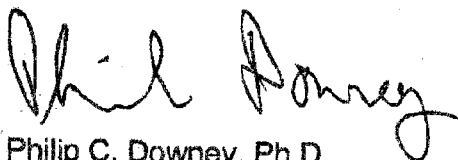
Dear Mr. Hinz,

Enclosed please find the report for macroinvertebrate identifications for the Potlatch, Idaho site. Overall, the diversity of organisms was low with the predominant organisms being worms (Oligochaetes) and midge larvae (Chironomidae). Our internal QC check of sorting efficiency averaged 94 percent.

This report submittal completes the Potlatch project.

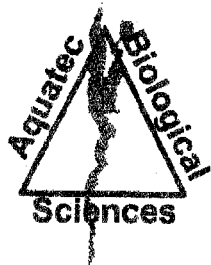
If you have any questions or we can be of further assistance, please don't hesitate to contact me.

Sincerely,



Philip C. Downey, Ph.D.
Director

enclosure



Aquatec Biological Sciences



Shaun Hinz
Anchor Environmental
1423 3rd Ave. Ste. 300
Seattle, WA 98101

Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30198
Client Sample ID : LGP-09-1BC-A
Remarks :

Date/Time Sample Collected : 7/25/2005 @ 8:05:00 A
Percent Sample Examined : 100
Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total/ Sample
Annelida	Oligochaeta	Tubificida	Tubificidae				42	42
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Chironomus</i> sp.	9	9
						<i>Endochironomus</i> sp.	1	1
Sub-Total:							52	52
Grand Total:							52	52



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Shaun Hinz
Anchor Environmental
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Seattle, WA 98101

Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30109

Client Sample ID : LGP-09-2BC-A

Remarks :

Date/Time Sample Collected : 7/25/2005 @ 8:25:00 A

Percent Sample Examined : 100

Sampling Depth (m) : Not Reported


Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total/ Sample
Annelida	Oligochaeta	Tubificida	Tubificidae				67	67
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Chironomus</i> sp.	5	5
						<i>Endochironomus</i> sp.	2	2
Sub-Total:							74	74
Annelida	Oligochaeta	Tubificida	Tubificidae				6	6
Sub-Total:							6	6
Grand Total:							80	80



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Seattle, WA 98101

Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30110
Client Sample ID : LGP-09-3BC-A
Remarks :

Date/Time Sample Collected : 7/25/2005 @ 8:28:00 A
Percent Sample Examined : 100
Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total/ Sample
Annelida	Oligochaeta	Tubificida	Naididae				3	3
			Tubificidae				39	39
Arthropoda	Insecta	Diptera	Chironomidae				1	1
				Chironominae	Chironomini	<i>Chironomus sp.</i>	5	5
						<i>Endochironomus sp.</i>	1	1
Sub-Total:							49	49
Annelida	Oligochaeta	Tubificida	Tubificidae				2	2
Sub-Total:							2	2
Grand Total:							51	51



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Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30111
Client Sample ID : LGP-01-1BC-A
Remarks :

Date/Time Sample Collected : 7/25/2005 @ 11:45:00
Percent Sample Examined : 100
Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total/ Sample
Annelida	Oligochaeta	Tubificida	Tubificidae				8	8
Arthropoda	Crustacea	Amphipoda	Corophiidae			<i>Corophium sp.</i>	13	13
	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Chironomus sp.</i>	4	4
				Tanypodinae	Pentaneurini	<i>Ablabesmyia sp.</i>	1	1
Sub-Total:							26	26
Grand Total:							26	26



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Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30112

Client Sample ID : LGP-01-2BC-A

Remarks :

Date/Time Sample Collected : 7/25/2005 @ 11:55:00

Percent Sample Examined : 100

Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total/ Sample
Annelida	Oligochaeta	Tubificida	Tubificidae			<i>Branchiura sowerbyi</i>	2	2
Arthropoda	Crustacea	Amphipoda	Corophiidae			<i>Corophium sp.</i>	5	5
	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Chironomus sp.</i>	2	2
Sub-Total:							9	9
Grand Total:							9	9



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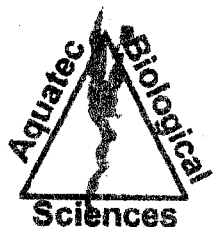
Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30113
Client Sample ID : LGP-01-3BC-A
Remarks :

Date/Time Sample Collected : 7/25/2005 @ 12:00:00
Percent Sample Examined : 100
Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total Sample
Annelida	Oligochaeta	Tubificida	Tubificidae			<i>Branchiura sowerbyi</i>	1	1
Arthropoda	Crustacea	Amphipoda	Corophiidae			<i>Corophium sp.</i>	9	9
	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Chironomus sp.</i>	9	9
Sub-Total:							19	19
Grand Total:							19	19



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Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30114
Client Sample ID : LGP-06-1BC-A
Remarks :

Date/Time Sample Collected : 7/25/2005 @ 2:35:00 P
Percent Sample Examined : 100
Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total Sample
Annelida	Oligochaeta	Tubificida	Tubificidae				5	5
Arthropoda	Insecta	Diptera	Chironomidae			<i>Chironomid pupa</i>	1	1
				Chironominae	Chironomini	<i>Chironomus sp.</i>	4	4
Sub-Total:							10	10
Grand Total:							10	10



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Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30115	Date/Time Sample Collected : 7/25/2005 @ 2:55:00 P
Client Sample ID : LGP-06-2BC-A	Percent Sample Examined : 100
Remarks :	Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total/ Sample
Annelida	Oligochaeta	Tubificida	Tubificidae				6	6
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini		1	1
						<i>Chironomus sp.</i>	9	9
						<i>Endochironomus sp.</i>	1	1
Sub-Total:							17	17
Grand Total:							17	17



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Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30116

Client Sample ID : LGP-06-SBC-A

Remarks :

Date/Time Sample Collected : 7/25/2005 @ 3:00:00 P

Percent Sample Examined : 100

Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total Sample
Annelida	Oligochaeta	Tubificida	Tubificidae				18	18
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Chironomus</i> sp.	3	3
						<i>Endochironomus</i> sp.	2	2
Sub-Total:							23	23
Grand Total:							23	23



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Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30117
Client Sample ID : LGP-11-1BC-A
Remarks :

Date/Time Sample Collected : 7/25/2005 @ 4:05:00 P
Percent Sample Examined : 100
Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total/ Sample
Annelida	Oligochaeta	Tubificida	Tubificidae				8	8
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Chironomus</i> sp.	3	3
						<i>Dicratendipes neomodestus</i>	1	1
						<i>Endochironomus</i> sp.	1	1
				Tanytopodinae	Pentaneurini	<i>Ablebesmyia</i> sp.	1	1
Sub-Total:							14	14
Grand Total:							14	14



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Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30118
Client Sample ID : LGP-11-2BC-A
Remarks :

Date/Time Sample Collected : 7/25/2005 @ 4:10:00 P
Percent Sample Examined : 100
Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total/ Sample
Annelida	Oligochaeta	Tubificida	Tubificidae				16	16
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini		1	1
						<i>Chironomus sp.</i>	1	1
Sub-Total:							18	18
Grand Total:							18	18



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Ecology

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Shaun Hinz
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Seattle, WA 98101

Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30119
Client Sample ID : LGP-11-3BC-A
Remarks :

Date/Time Sample Collected : 7/25/2005 @ 4:20:00 P
Percent Sample Examined : 100
Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total/ Sample
Annelida	Oligochaeta	Tubificida	Tubificidae				6	6
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Chironomus</i> sp.	4	4
				Tanypodinae	Tanypodini	<i>Tanypus</i> sp.	1	1
Sub-Total:							11	11
Grand Total:							11	11



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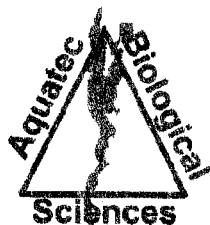
Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30120
Client Sample ID : LGP-13-1BC-A
Remarks :

Date/Time Sample Collected : 7/26/2005 @ 8:45:00 A
Percent Sample Examined : 100
Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total Sample
Annelida	Oligochaeta	Tubificida	Naididae				7	7
			Tubificidae				46	46
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Chironomus sp.</i>	3	3
						<i>Dicrolendipes neornodestus</i>	1	1
						<i>Endochironomus sp.</i>	1	1
					Tanytarsini	<i>Rheotanytarsus exiguus</i>	1	1
			Tanypodinae	Procladiini	<i>Procladius sublettei</i>	1	1	
Sub-Total:							60	60
Grand Total:							60	60



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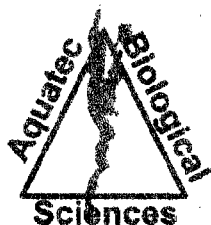
Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30121
Client Sample ID : LGP-13-2BC-A
Remarks :

Date/Time Sample Collected : 7/26/2005 @ 8:50:00 A
Percent Sample Examined : 100
Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total/ Sample
Annelida	Oligochaeta	Tubificida	Tubificidae				21	21
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Dicrotendipes neomodestus</i>	1	1
						<i>Endochironomus sp.</i>	1	1
Sub-Total:							23	23
Grand Total:							23	23



Aquatec Biological Sciences



Ecology

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Shaun Hinz
Anchor Environmental
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Seattle, WA 98101

Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30122

Client Sample ID : LGP-13-3BC-A

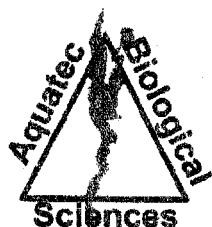
Remarks :

Date/Time Sample Collected : 7/26/2005 @ 8:55:00 A

Percent Sample Examined : 100

Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total/ Sample
Annelida	Oligochaeta	Tubificida	Naididae				2	2
			Tubificidae				26	26
Arthropoda	Insecta	Diptera	Chironomidae				1	1
				Chironominae	Chironomini	<i>Chironomus sp.</i>	1	1
Sub-Total:							30	30
Grand Total:							30	30



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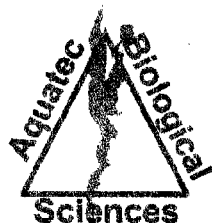
Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30123
Client Sample ID : LGP-14-1BC-A
Remarks :

Date/Time Sample Collected : 7/26/2005 @ 10:00:00
Percent Sample Examined : 100
Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total/ Sample
Annelida	Oligochaeta	Tubificida	Tubificidae				34	34
Arthropoda	Insecta	Diptera	Chironomidae			<i>Chironomid pupa</i>	5	5
				Chironominae	Chironomini	<i>Chironomus sp.</i>	59	59
Sub-Total:							98	98
Grand Total:							98	98



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Ecology

Environmental
ToxicologyNatural Resource
Assessments

Microbiology

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Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30124
Client Sample ID : LGP-14-2BC-A
Remarks :

Date/Time Sample Collected : 7/26/2005 @ 10:03:00
Percent Sample Examined : 100
Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total/ Sample
Annelida	Oligochaeta	Tubificida	Tubificidae				39	39
Arthropoda	Insecta	Diptera	Chironomidae			<i>Chironomid pupa</i>	2	2
				Chironominae	Chironomini	<i>Chironomus sp.</i>	37	37
						<i>Endochironomus sp.</i>	1	1
				Orthocladiinae	Orthocladiini	<i>Nanocladius sp.</i>	1	1
Sub-Total:							80	80
Grand Total:							80	80



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Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

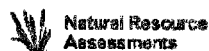
Laboratory Sample ID : 30125
Client Sample ID : LGP-14-3BC-A
Remarks :

Date/Time Sample Collected : 7/26/2005 @ 10:07:00
Percent Sample Examined : 100
Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total/ Sample
Annelida	Oligochaeta	Tubificida	Naididae				2	2
			Tubificidae				90	90
Arthropoda	Insecta	Diptera	Chironomidae			<i>Chironomid pupa</i>	2	2
				Chironominae	Chironomini	<i>Chironomus sp.</i>	36	36
Sub-Total:							130	130
Grand Total:							130	130



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Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30126
Client Sample ID : SR-REF-1BC-A
Remarks :

Date/Time Sample Collected : 7/26/2005 @ 11:58:00
Percent Sample Examined : 100
Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total/ Sample
Annelida	Oligochaeta	Tubificida	Tubificidae				16	16
Arthropoda	Insecta	Diptera	Chironomidae			<i>Chironomid pupa</i>	3	3
				Chironominae	Chironomini	<i>Chironomus sp.</i>	60	60
				Tanytopodinae	Procladiini	<i>Procladius sp.</i>	2	2
Sub-Total:							81	81
Grand Total:							81	81



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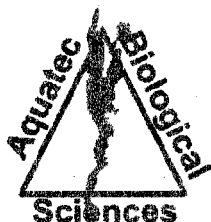
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Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30127	Date/Time Sample Collected : 7/26/2005 @ 12:00:00
Client Sample ID : SR-REF-2BC-A	Percent Sample Examined : 100
Remarks :	Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total/ Sample
Nematoda							1	1
Annelida	Oligochaeta	Tubificida	Tubificidae				20	20
Arthropoda	Insecta	Diptera	Chironomidae			<i>Chironomid pupa</i>	2	2
				Chironominae	Chironomini	<i>Chironomus sp.</i>	94	94
				Orthocladiinae	Orthocladiini	<i>Nanocladius sp.</i>	1	1
				Tanytoidinae	Procladiini	<i>Procladius subletti</i>	3	3
Sub-Total:							121	121
Grand Total:							121	121



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Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30128

Date/Time Sample Collected : 7/26/2005 @ 12:03:00

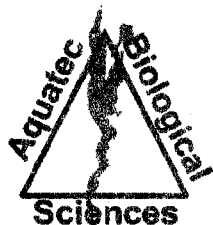
Client Sample ID : SR-REF-3BC-A

Percent Sample Examined : 100

Remarks :

Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total/ Sample
Annelida	Oligochaeta	Tubificida	Tubificidae				18	18
Arthropoda	Insecta	Diptera	Chironomidae			<i>Chironomid pupa</i>	4	4
				Chironominae	Chironomini	<i>Chironomus sp.</i>	72	72
				Tanytopodinae	Procladlini	<i>Procladius sp.</i>	12	12
Sub-Total:							106	106
Grand Total:							106	106



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Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30129

Client Sample ID : CR-REF-1BC-A

Remarks :

Date/Time Sample Collected : 7/26/2005 @ 2:42:00 P

Percent Sample Examined : 100

Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total Sample
Annelida	Oligochaeta	Tubificida	Tubificidae				80	80
Arthropoda	Insecta	Diptera	Chironomidae				1	1
						<i>Chironomid pupa</i>	5	5
				Chironominae	Chironomini	<i>Chironomus sp.</i>	277	277
						<i>Endochironomus sp.</i>	36	36
						<i>Hamischia sp.</i>	5	5
				Tanypodinae	Pentaneurini	<i>Thienemanniya sp.</i>	1	1
Sub-Total:							405	405
Annelida	Oligochaeta	Tubificida	Tubificidae				8	8
Mollusca	Pelecypoda	Prionodesmacea	Sphaeriidae			<i>Musculium sp.</i>	11	11
Arthropoda	Insecta	Diptera	Chironomidae				1	1
				Chironominae	Chironomini	<i>Chironomus sp.</i>	12	12
						<i>Endochironomus sp.</i>	3	3
Sub-Total:							35	35
Grand Total:							440	440



Aquatec Biological Sciences

 Ecology

 Environmental Toxicology

 Natural Resource Assessments

 Microbiology

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Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30130

Client Sample ID : CR-REF-2BC-A

Remarks :

Date/Time Sample Collected : 7/26/2005 @ 2:50:00 P

Percent Sample Examined : 100

Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total Sample
Annelida	Oligochaeta	Tubificida	Tubificidae				13	13
Mollusca	Pelecypoda	Prionodesmacea	Sphaeriidae			<i>Musculium sp.</i>	6	6
Arthropoda	Insecta	Diptera	Chironomidae			<i>Chironomid pupa</i>	1	1
				Chironominae	Chironomini	<i>Chironomus sp.</i>	227	227
						<i>Endochironomus sp.</i>	12	12
						<i>Harnischia sp.</i>	7	7
				Tanypodinae	Procladini	<i>Procladius sp.</i>	1	1
Sub-Total:							267	267
Grand Total:							267	267



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Date : 12/31/2005
BTR No. : 08909
Project No. : 05052
No. of Samples : 24
Date Received : 8/2/2005

Reference: Project #050297-1T4

Laboratory Sample ID : 30131
Client Sample ID : CR-REF-3BC-A
Remarks :

Date/Time Sample Collected : 7/26/2005 @ 2:53:00 P
Percent Sample Examined : 100
Sampling Depth (m) : Not Reported

Phylum	Class	Order	Family	Sub-Family	Tribe	Genus/Species/Variety	# Counted	Total/ Sample
Annelida	Oligochaeta	Tubificida	Tubificidae				11	11
Arthropoda	Insecta	Diptera	Chironomidae			<i>Chironomid pupa</i>	2	2
				Chironominae	Chironomini	<i>Chironomus sp.</i>	158	158
						<i>Endochironomus sp.</i>	26	26
						<i>Harnischia sp.</i>	1	1
					Tanytarsini	<i>Paratanytarsus sp.</i>	2	2
Sub-Total:							200	200
Annelida	Oligochaeta	Tubificida	Tubificidae				1	1
Mollusca	Pelecypoda	Prionodesmacea	Sphaeriidae			<i>Musculum sp.</i>	3	3
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Chironomus sp.</i>	4	4
						<i>Endochironomus sp.</i>	2	2
Sub-Total:							10	10
Grand Total:							210	210

Submitted By:

Philip C. Doney

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273 Commerce Street, Williston, VT 05495 Tel: 802.860.1636 Fax: 802.658.3189

APPENDIX B
SEDIMENT SAMPLING DATA

Appendix B
Sediment Sampling Data
2005 Benthic Macroinvertebrate Sampling
Potlatch Mill, Lewiston Idaho

				Diffuser →						
Analyte	Units	SR-REF	CR-REF		LGP-13	LGP-14	LGP-11	LGP-09	LGP-06	LGP-01
Total Organic Carbon	%	2.8	0.905		2.22	2.245	3.925	4.285	2.68	1.488
Total Resin Acids	mg/kg	4,235.4	1,715.5		7,100.7	2,864.0	11,495.4	4,643.0	3,834.8	767.0
Total Resin Acids - OC	mg/kg-OC	1,512.6	1,895.6		3,198.5	1,275.7	2,928.8	1,083.5	1,430.9	515.5
2,3,7,8-TCDD	ng/kg	ND	ND		ND	ND	ND	ND	ND	ND
2,3,7,8-TCDF	ng/kg	0.142	0.035 U		0.127	0.334	0.613	0.201	0.158	0.247
2,3,7,8-TCDF - OC	ng/kg-OC	0.051	0.039		0.057	0.149	0.156	0.047	0.059	0.166
B-sitosterol	ug/kg	34,325	10,185		30,700	26,100	58,700	52,350	31,550	7,055
B-sitosterol - OC	ug/kg-OC	12,258.9	11,254.1		13,828.8	11,625.8	14,955.4	12,217.0	11,772.4	4,741.3
Retene	ug/kg	106.4	21.3		117.3	250	243	385.3	227.5	17.7
Retene - OC	ug/kg-OC	38	23.54		52.84	111.36	61.91	89.92	84.89	11.90

Notes:

OC - Organic Carbon adjusted

ND - Analyte not detected in any of the reference or downstream locations

U - Analyte not detected in the sample; value reported is one-half the detection limit.